Montana Department of Environmental Quality

Use Attainability Analysis

For an

Unnamed Tributary to the Dry Fork of the Marias

Pondera County, Montana

March 28, 2008

Approvals (Signatures on File)

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EXECUTIVE SUMMARY

The Department conducted a Use Attainability Analysis (UAA) per ARM 17.30.615(2) to determine whether the current classification of a portion of the Dry Fork Marias River drainage was appropriate. This investigation was initiated upon request of the City of Conrad in consideration of their impending upgrade to their waste water treatment facility.

The Department collected a variety of physical, chemical, and biological data to determine the most appropriate use classification for the tributary that receives Conrad's effluent and whether this portion of the Dry Fork Marias was most appropriately classified.

The Department's conclusion is that the most appropriate use classification for the studied portion of the Dry Fork Marias drainage is B-3, since the data and information support that the water can not be expected to support salmonids. The Department believes that the salmonid use support is not attainable due to naturally occurring warm water temperatures. Removing the designated use of salmonid fishes is consistent with 40 CFR §131.10(g)(1) of the Clean Water Act, where temperature is serving as the pollutant preventing the attainment of the growth and marginal propagation of salmonid fishes.

The proposed amendment would modify ARM 17.30.610(1)(d)(iii) to move the cutoff point where the Dry Fork of the Marias River changes from a B-2 to a B-3 upstream by approximately half a mile from Interstate 15 to Highway 91. The decision to remove the designated use of salmonid fishes is based on temperature and fish data collected during the study, as well as historical temperature data. The Department believes that this portion of the Dry Fork of the Marias River is misclassified and that this stream should be classified as a warmwater waterbody for non-salmonid fishes.

1.0 INTRODUCTION

All waterbodies within the state of Montana were classified in the early 1960s according to beneficial uses they were expected to support. These uses include the following: drinking, culinary use, and food processing; aquatic life support for fishes and associated aquatic life; support for waterfowl and furbearers; support for bathing, swimming, recreation and aesthetics; agriculture water supply, and industrial water supply. Per 75-3-301 of the Montana Code Annotated (MCA), this classification system is meant to reflect not only the present beneficial uses, but also the future uses that they should be capable of supporting.

MCA 75-5-101 states that "it is the public policy of the state to conserve water by protecting, maintaining, and improving the quality and potability of water for public water supplies, wildlife, fish and aquatic life, agriculture, industry, recreation and other beneficial uses."

However, there are times when a waterbody is not capable of supporting any of the designated beneficial uses and/or was never capable of historically supporting these uses. This can be a result of a natural condition or a manmade structure that has altered the condition of the waterbody (dam, diversion, etc). It can also be a result of the waterbody being originally misclassified.

Per Montana Statute (MCA 75-5-302), a waterbody can only be reclassified if there is reason to believe that it was originally misclassified to begin with. The reclassification process must be initiated through a process called a Use Attainability Analysis (UAA). A UAA is defined in the Administrative Rules of Montana (ARM) 17.30.602(40) as "a scientific assessment and analysis of the factors affecting the attainment of a use(s)." Information that may be used in the assessment includes chemical, physical and biological data, as well as photo documentation and comparison to reference conditions, which are of sufficient detail to accurately portray the historical and existing uses of a waterbody. In order for a waterbody to be reclassified a UAA must be conducted (ARM 17.30.615(2)), and it must provide sufficient information to support the alleged misclassification.

In addition to the state's requirements, the Environmental Protection Agency (EPA) also requires a UAA whenever a state wishes to remove a designated use that is specified in Clean Water Act (CWA) section §101(a)(2) or to adopt subcategories of uses specified in section §101(a)(2) that require less stringent criteria (40 CFR §131.10(j)(2)). States may not remove designated uses if they are existing uses as per CFR §131.10(h)(1). Existing uses are defined as those uses actually attained in state waters on or after November 28, 1975, whether or not those uses are included in the water quality standards (§ 131.3(e))

Under 40 CFR §131.10(g) of the CWA, states may remove a designated use which is not an existing use or establish sub-categories of a use if the state can demonstrate that attaining the designated use is not feasible because:

(1) Naturally occurring pollutant concentrations prevent the attainment of the use; or

(2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or

(3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or

(4) Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or

(5) Physical conditions related to the natural features of the water body, such as lack of a proper substrate, cover, flow; depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or

(6) Controls more stringent than those required by sections 301 (b) and 306 of the Act would result in substantial and widespread economic and social impact...

In summary, in order to reclassify a waterbody in Montana it must be shown that the waterbody was misclassified to begin with. In addition to meeting the misclassification requirement for the state of Montana, the reason for the misclassification must also fall under one of the six exceptions listed above. Furthermore, the reclassification itself must be approved by the Department, the Board of Environmental Review (BER) and the EPA.

2.0 BACKGROUND

2.1 City of Conrad Wastewater Treatment Facility

The City of Conrad wastewater treatment facility (WWTF) was built in 1958. The system originally consisted of a two-celled facultative treatment system. In 1972, the system was upgraded and an aerated cell was added. Today the WWTF is a three-cell, partially aerated, secondary treatment lagoon facility with a continuous discharge design flow of 0.65 million gallons per day. The three lagoon cells are all in use and no disinfectants are used. The total design volume of the three cells is 36.9 million gallons with a designed retention time between 120-160 days. However, due to sludge build-up in the lagoons the effective volume has been reduced in the ponds to 29.9 million gallons, with an overall retention time of around 85 days (Morrison Maierle, Inc. Preliminary Engineering Review (PER), 1999).

After retention the effluent is discharged into an unnamed tributary (Tributary) that flows into the Dry Fork of the Marias River (DFMR). The distance from the point of discharge to the confluence with the DFMR is approximately 1.9 miles.

2.2. Receiving Waters

The Tributary is located in Pondera County and is part of the Marias River watershed (USGS HUC 10030203). The DEQ assessment unit number for the tributary is MT41P003_030. The Tributary flows directly into the DFMR, which in turn flows into the Marias River. The classification for the Tributary and this portion of the DFMR is B-2.

Streams classified as B-2 are waters "to be maintained suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply" (ARM 17.30.624).

The Marias Watershed is classified as B-2, which means that all of the waterbodies within this watershed are classified as B-2, unless otherwise stated in the ARM. One of these exceptions occurs on the mainstem DFMR and starts approximately ½ mile downstream from the confluence with the Tributary where the classification of the DFMR changes from B-2 to B-3. The transition segment that changes from B-2 to B-3 is from Interstate 15 (I-15) to its confluence with the Marias River. The entire DFMR was originally classified as B-2 until 1981, when a biologist from the Montana Department of Fish, Wildlife and Parks (FWP) provided information to the Department that salmonid fish species would not propagate or survive in this portion of the DFMR due to natural high water temperatures. The classification change was made as is reflected in the rules today.

Streams classified as B-3 support the same beneficial uses as B-2, but support "growth and propagation of non-salmonid fish and associated aquatic life" (ARM 17.30.625) rather than "growth and marginal propagation of salmonid fish and associated aquatic life".

2.3 City of Conrad WWTF Discharge Permit

On March 7, 2006, the City of Conrad met with the Permitting Section with the Department of Environmental Quality (Department) to discuss effluent limits and options for their WWTF renewal permit. Concern was raised over the current classification of the receiving waters and whether it was overly protective.

The Permitting Section of the Department suggested that a UAA be conducted to assess the Tributary and determine whether the current classification was appropriate. Since portions of the tributary were known to go dry during certain times of the year, an ephemeral classification of E-2 was suggested. Ephemeral waters are defined in ARM 17.30.602(12) as "a stream or part of a stream which flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice and whose channel bottom is always above the local water table." E-2 streams "are to be maintained suitable for agricultural purposes, secondary contact recreation, and wildlife." Because of habitat, low flow, hydro-geomorphic and other physical conditions, E-2 waters are considered marginally suitable for aquatic life.

The E-2 classification would also allow for modification of the ammonia limits in the discharge permit. Per 17.30.635(2)(b) ARM, ammonia standards may be modified or removed based on the results of a UAA.

2.4 Area Characterization

2.4.1 Northwestern Glaciated Plains Ecoregion

The DFMR and the Tributary are located in the "Northwestern Glaciated Plains Ecoregion." This ecoregion was derived from Omernik's Level III Ecoregions (Omnerik 1995). These ecoregions were determined by examining patterns of vegetation, animal life, geology, soils, water quality, climate, and human land use, as well as other living and non-living ecosystem components. The Northwestern Glaciated Plains ecoregion is a "transitional region between the generally more level, moister, more agricultural Northern Glaciated Plains to the east and the generally more irregular, dryer, Northwestern Great Plains to the west and southwest."

2.4.2 Associated Ecosystems

Within each ecoregion there are associated ecosystems. According to the document "Aquatic Community Classification and Ecosystem Diversity in Montana's Missouri River Watershed" (Stagliano 2005), the DFMR is considered a "Northern Glaciated Prairie Stream" ecosystem. Characteristics of this ecosystem include perennial cool/warm-water streams. In low elevation (800-1000m) areas, these are meandering streams with long runs, and wide continuous pools (0.5-1.5 m in depth) connected by narrow (average wetted width ~2m) infrequently spaced (~40 times wetted width) riffles that may maintain connectivity throughout the year, although riffles may be absent in incised and degraded channel sections (Stagliano 2005). Substrate characteristics are typically cobble/pebble riffles (when present) to pebble/gravel runs and deeply silted pools. Side channel vegetation, undercut banks and vegetated, deep pools provide the most diverse fish habitat. Woody debris is largely absent from these streams.

The location and attributes of the Tributary categorize it as a "Northern Glaciated Intermittent Stream Ecosystem." Characteristics of this ecosystem are long pools that are usually vegetated, separated from each other by narrowed riffle areas that are usually dry by early summer forming isolated pools.

2.5 Study Area

On April 19, 2006, DEQ staff performed field reconnaissance to identify sampling sites and determine which sites would best represent the conditions of the Tributary. The Tributary starts above the lagoons by the golf course in Conrad. The focus for this study was the portion of the Tributary below the lagoons. Sites were selected to represent conditions throughout the Tributary. The portion of the Tributary studied in this UAA is shown in Figure 2-1. The red outline shows the flow of the Tributary downstream from the lagoons. The blue arrows depict stream flow movement. The DFMR flows from west to east, as depicted in Figure 2-1.

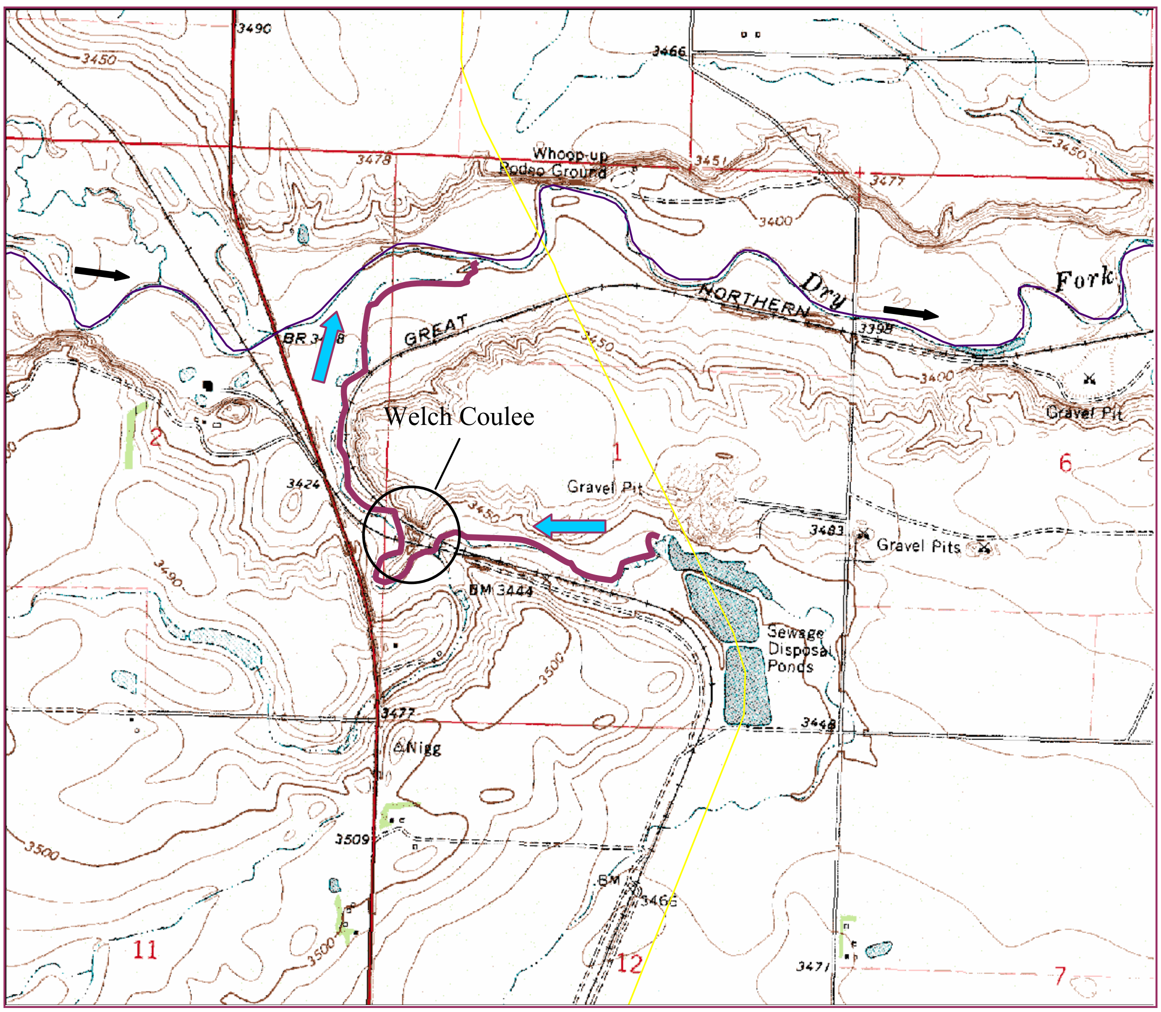

Figure 2-1: Topographic map of Tributary and DFMR studied in the UAA
Map is 2.06 miles wide (Montana Topographic Map Finder).

Topographic maps identify the Tributary as intermittent. An additional unnamed tributary joins the Tributary approximately 1/4 mile downstream of the discharge pipe and forms Welch Coulee.

The elevation of the DFMR and the Tributary is between 3300 and 3400 feet (1005 to 1036 meters). Information provided by the Natural Resource Information System (NRIS) shows land use as follows: grazing is approximately 45% of the area; irrigation 30%, and fallow crop 25%. Other uses of the area include industrial use of water from the Tributary. The Conrad Sand and Gravel Company diverts water from the Tributary into a holding pond to make concrete and concrete products.

Records from the Montana Department of Natural Resources and Conservation (DNRC) show several water rights for Welch Coulee and other portions of the Tributary. Appendix A provides information on the water rights for the Tributary.

2.5.1 Adjoining Tributaries

There are several tributaries that drain into the portion of the DFMR upstream of I-15 as well as the Tributary. The following is a list of these tributaries with the associated river mile. The river mile starts from the confluence of the DFMR and the Marias River.

Table 2.1: List of tributaries and associated river miles to DFMR upstream of Interstate 15.

Tributary Name	River Mile
Big Flat Coulee	**20.65**
Spring Creek	**23.9**
Barber Coulee	**29.87**
Lone Man Coulee	**38.5**
North Fork Dry Fork Marias River	**47.15**
Middle Fork Dry Fork Marias River	**55.05**
South Fork Dry Fork Marias River	**55.05**

3.0 USE ATTAINABILITY ANALYSIS STUDY

3.1 Purpose and Objectives

The purpose of this study was to determine the most appropriate use classification for these waters. Specific objectives of the study were to:

1. Determine the ephemeral or perennial nature of the waterbody;
2. Determine the appropriate use support for the Tributary and the DFMR; and
3. Provide quality data and information to support the analysis and recommendation to the Board of Environmental Review.

3.2 Site Selection

Prior to the study a Sampling and Analysis Plan (SAP) was developed to guide the UAA process. The SAP is available from the Montana DEQ Water Quality Standards Section. Six sites were chosen to represent the conditions throughout the Tributary and upstream and downstream of the DFMR (Figure 3-1). The triangles represent the approximate location of each site, and the arrows depict flow direction. The DFMR flows from west to east (left to right). An additional groundwater source downstream of Welch Coulee flows into the Tributary from the west and is shown below. Flow direction of the Tributary is illustrated with arrows.

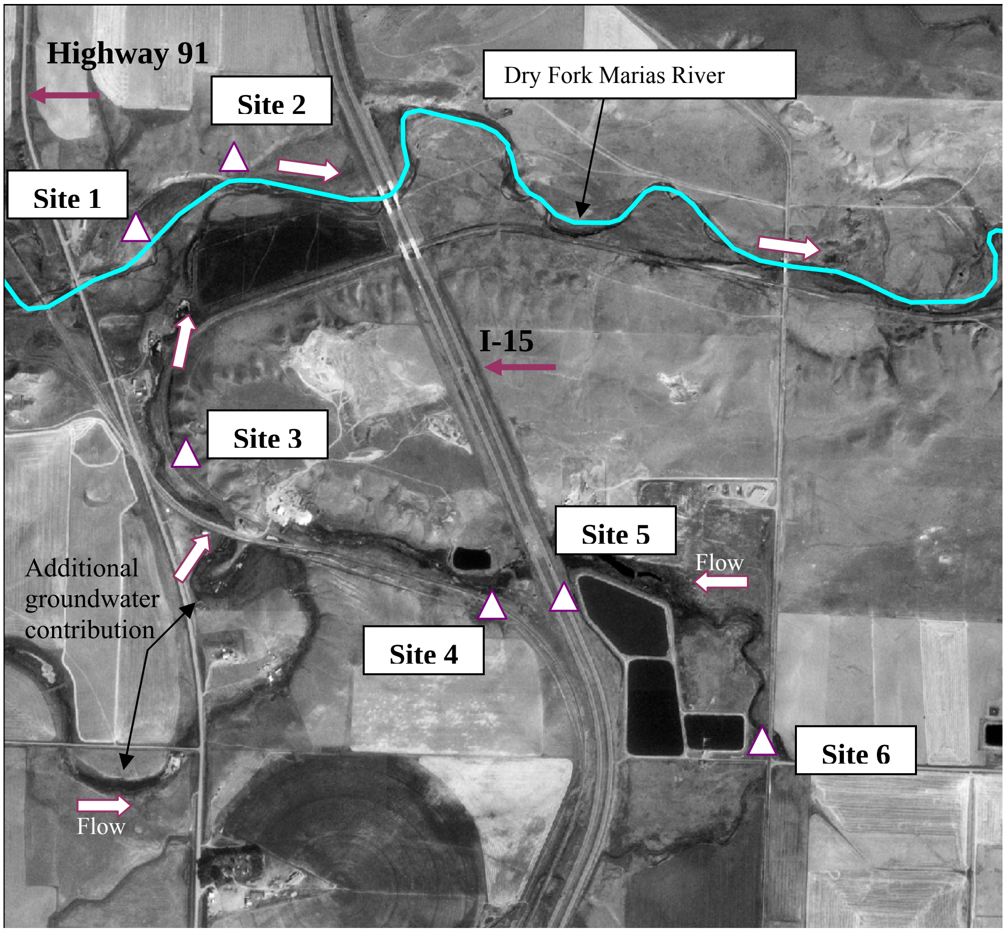

Figure 3-1: Aerial photograph of selected sites along the Tributary and DFMR
Map is 2.06 miles wide (Montana Topographic Map Finder).

The following information was collected for each site when conditions permitted: temperature and flow data; fish and macroinvertebrates; water samples, and photos. Information for each site including latitude, longitude, fish and macroinvertebrate collection, and whether temperature loggers were placed at each site can be found in Appendix B.

The following provides information for the sites selected for this study, starting upstream and ending with the confluence with the DFMR.

Site 6:

Site 6 is upstream of the lagoons and located along a roadside ditch on Old North Trail Road (Figure 3-2). This site was chosen to reflect conditions in the Tributary upstream of the discharge. Data and samples collected at this location included nutrient samples, photos, metadata, field parameters and macroinvertebrates. A temperature logger was placed at this site.

This site had grass vegetation and very little flow. The conditions at this site were typical of a drainage ditch. Substrate consisted entirely of mud and silt. There were no pools at this site.

Figure 3-2: Tributary above the City of Conrad wastewater treatment lagoons (Site 6)

Site 5

Site 5 is the discharge pipe for the lagoons (Figure 3-3). Information was collected from this site to show the quality of the discharge water. Data collected at this location included nutrient samples, photos, metadata and field parameters. A temperature logger was not placed at this site and macroinvertebrates were not collected.

Figure 3-3: Discharge pipe for the Conrad wastewater lagoons (Site 5)

Site 4

This site was selected to represent water conditions in the Tributary downstream of the discharge pipe. During the initial site reconnaissance fish were observed at this site. This site is downstream of a diversion (Figure 3-4) used to divert water for the Conrad Sand and Gravel Company (Figure 3-5). Data and samples collected at this location included nutrient samples, photos, metadata, field parameters, macroinvertebrates and flow. A temperature logger was placed at this site.

This site had vegetation along the banks. The substrate consisted of mud and silt with no cobble or any other rocks. Pools were absent at this site.

Figure 3-4: Site 4 on the Tributary located slightly downstream of diversion used for the Conrad Sand and Gravel Company.

Figure 3-5: Holding pond for Conrad Sand and Gravel Company. Water from the Tributary is diverted to this pond.

Site 3

Site three (Figure 3-6) is located less than 1/4 mile upstream from the confluence with the DFMR. It is also slightly downstream of Welch Coulee. The additional water source that flows into Welch Coulee from the west can be seen in Figure 3-1. This site had high gradient and no pools or riffles. Along the banks there was abundant grass vegetation. Substrate consisted of mud and silt with little to no cobble. Data and samples collected at this location included nutrient samples, photos, metadata, field parameters, macroinvertebrates and flow. A temperature logger was placed at this site.

Figure 3-6: Upstream view of site 3 in the Tributary.

Site 2

Site 2 (Figure 3-7) is located less than 500 feet downstream from the confluence with the Tributary (Figure 3-8). This site was chosen to represent water conditions in the DFMR downstream of the confluence with the Tributary. This site had little to no cobble or rocks and the vegetation was dominated by grasses. Substrate was typically mud and silt, and pools were absent at this site. Data and samples collected at this location included nutrient samples, photos, metadata, field parameters, macroinvertebrates and flow. A temperature logger was placed at this site.

Figure 3-7: Downstream view of the Tributary at site 2.

Figure 3-8: Confluence of the Tributary and the Dry Fork of the Marias River

Site 1

Site 1 (Figure 3-9) is located on the DFMR upstream of the confluence with the Tributary. The site is downstream of the bridge on Highway 91, and was selected to determine the water quality of the receiving waters upstream of the confluence. This site had little to no cobble or rocks and the vegetation was dominated by grasses. The area slightly upstream of this site had a few riffles. Substrate consisted mostly of mud and silt, and some small pebbles. Pools were absent at this site.

Data and samples collected at this location included nutrient samples, photos, metadata, field parameters, macroinvertebrates and flow. A temperature logger was placed at this site.

Figure 3-9: Upstream view of the DFMR below Highway 91 (Site 1).

3.3 Methodology

The UAA was conducted from June through October of 2006. The study was conducted during the warmer months to document high temperatures and to determine base flow characteristics. Samples were collected monthly at each of the six sites. A list of the equipment used in this study is included as Attachment A.

3.3.1 Temperature

Temperature loggers were placed in five of the six sites to measure water temperatures and determine if any of the sites were dry during the sampling period. Temperature loggers were set to record water temperature for 30-minute increments. Each temperature logger was calibrated to a NIST traceable thermometer by DEQ Monitoring Section staff prior to being placed. The loggers were attached to bricks and placed in areas free from excessive vegetation and debris. Wooden stakes were painted orange and placed on the shore close to the temperature loggers to facilitate location and retrieval at the end of the study.

Temperature loggers were placed at sites 1, 2, 3, 4 and 6. A temperature logger was not placed at site 5, below the lagoon discharge pipe. Temperature data from this site was provided monthly by the City of Conrad as part of their permitting requirements.

3.3.2 Flow

Flow was collected at every site except at the lagoons discharge pipe (site 5). The protocol for collecting flow is listed in Attachment B under the "Flow Meter Method." Flow data for the discharge pipe (site 5) was obtained from the DEQ Permitting Section.

3.3.3 Fish

On June 6, 2006, fish were collected from the Tributary as well as upstream and downstream of the confluence with the DFMR. Toby Tabor, a fish technician with the Montana Department of Fish, Wildlife and Parks (FWP), collected fish with electrofishing equipment in both waterbodies. Electrofishing was not practical at the area above the lagoons or the area around the discharge pipe. The mesh size of the dip net used to collect the stunned fish was 1/8 inch.

3.3.4 Aquatic Life

On June 6, 2006, macroinvertebrate samples were collected from all of the sites except at the discharge pipe. Protocols for collecting the macroinvertebrates are detailed in Attachment C. Samples were preserved in ethanol, labeled, and sent to Rhithron and Associates in Missoula, Montana, for enumeration and identification.

3.3.5 Water Chemistry

Parameters analyzed included: nitrite plus nitrate (NO2 + NO3), total kjeldahl nitrogen (TKN), total phosphorus (TP), and ammonia. Samples were obtained using the "grab method" described in Attachment D. Samples were labeled, preserved, placed on ice, and hand delivered by the DEQ sampling crew to the Montana Department of Public Health and Human Services (DPHHS) Environmental Laboratory for analysis.

3.3.6 Other Parameters

Water temperature, electrical conductivity (EC), pH, and dissolved oxygen (DO) were measured at each site monthly using a YSI Model 85 field meter.

4.0 QUALITY ASSURANCE

4.1 Analytical Controls

Analytical controls were the responsibility of the laboratory. The contract laboratory maintains certification from USEPA Region 8, whom performs on-site technical system audits on a biennial schedule. This technical system audit includes review and documentation that the Laboratory Quality Assurance Program is being implemented by an organizationally independent staff member.

By reporting results under an EPA, APHA, or USGS method reference, the laboratory certifies that the method that produced the results is in conformance with the quality controls of that method. All analytical results reported for this project were reported in both hardcopy and electronic format, with the hardcopy signed by the laboratory director or designee. A copy of the analytical batch quality control data (QC Summary) accompanied all hardcopy analytical results.

All data and quality control results were evaluated by the DEQ QA Officer to verify that they met the quality control requirements described in the project Sampling and Analysis Plan. Results of this evaluation are available from the QA Section of the Water Quality Planning Bureau.

4.2 Field sampling controls

Negative control/Sensitivity - 1 field Blank was collected during each field event to demonstrate that the potential for a combination of; 1. Ambient (air) conditions at the time of sampling, 2. Bottle contamination, 3. Preservative contamination and 4. Laboratory contamination does not impact usability of chemistry data. A field audit of the sampling methods was conducted on August 4, 2006 by the Bureau QA Officer. Results of the audit are on file in the QA Section.

The criteria for field blanks for all results were ≤ reporting limit. Data were flagged as follows:

- If the detection of a target parameter was observed in the field blank but was less than 10% of the concentration from a sample result, the sample data was not rejected or flagged.

- If the detection of a target parameter was observed in the field blank and was 50% to 10% of the concentration from the sample result, the sample data was flagged with a "B" (Blank Contamination) qualifier. Decisions made with these data accounted for the possibility that the concentration reported was influenced by a contaminant in the sampling or analytical process and the results could have a positive bias.

- If the detection of a target parameter was observed in the field blank and was > 50% the concentration from the sample result, the sample data was flagged with an "R" (Rejected). These results were rejected from the study. Only one result was rejected, and it was a blank sample for the total phosphorus test.

- Precision (field) - To determine the reproducibility of the sampling technique and overall precision of the method, a co-located duplicate sample was collected at one site during each sampling event. The criteria for these field duplicates were < 20% RPD for results > 5 times the reporting limit. Data was flagged as follows:

- If duplicate results greater than 5 times the reporting limit failed to meet the criteria, data was flagged with a “J” (estimated) qualifier. Decisions made with “J” qualified data must account for the probability that a combination of sample heterogeneity, poor collection technique, or loss of method control in the laboratory resulted in poor reproducibility.

The sampling design used for this study was a targeted design. Its spatial divisions were designed to capture the extent of specific variables that were likely to influence beneficial use support. Temporally, this design was used over the course of six-months during a single year.

5.0 RESULTS

5.1 Temperature

Temperature loggers were retrieved from each site and brought back to the Department and the data downloaded. Average, maximum and minimum temperatures were calculated for each site. Site 3 was dry from approximately July 30 until August 21, 2006. Table 5.1 depicts the data for each site. The average temperatures for sites 1, 2, and 4 were calculated and the average temperature listed in parenthesis was the temperature adjusted for the dates that site 3 went dry. The average temperature for site 5 is listed in Table 5.1, although, the temperature high, low and average were based on individual monthly sampling events rather than from temperature logger data.

Table 5.1. Temperature high, low and averages for each site based on temperature logger data.

Site	High (˚C)	Low (˚C)	Average (˚C)
Site 1 (upstream confluence, DFMR)	27.5	4.8	**17.2 (16.7)** **
Site 2 (downstream confluence DFMR)	27.5	4.8	**17.1 (16.6)** **
Site 3 (Tributary above confluence)	30.6	1.2	**13.7**
Site 4 (Tributary below diversion)	32	4.9	**17.1 (17.3)** **
Site 5* (WWTF discharge pipe)	22.7	1.2	**15.6**
Site 6 (Tributary above lagoons)	24.5	9.5	**16.5**

** Site 5 temperature data was based on monthly temperature readings from the City of Conrad since a temperature logger was not placed at this site.*
*** Temperatures in parenthesis were adjusted to the dates that site 3 went dry.*

5.1.1 Average Daily Temperatures

The average daily temperature data for sites 1, 2, 3, 4 and 6 can be viewed in Appendix C. The daily temperatures were averaged for each site, and the graphs depict the average daily temperatures in seven day increments (days 1-7, 8-15, etc.). The optimal growth temperatures for brown trout and rainbow trout are provided on the charts. Rainbow trout and brown trout are two of the more tolerant species of salmonids found in Montana. The optimal growth temperature for brown trout is between 12-19˚C (Ojanguren et al. 2001), so the average of the temperatures (15.5˚C) was used for the charts. The optimal growth temperature for rainbow trout is 13.1˚C (Bear et al 2007).

Average daily temperatures for sites 1, 2 and exceeded the optimal growth temperatures for rainbow trout numerous times from the beginning of June through the middle of September. Site 3 exceeded the optimal growth temperature from the beginning of June through August. This site went dry from approximately July 30 through August 22, 2006. The optimal growth temperature was exceeded from the beginning of June through the middle of September for Site 4. Temperatures exceeded the optimal growth from the beginning of June through the end of July for site 6.

5.1.2 Maximum Daily Temperatures

Appendix D depicts the maximum daily temperatures for sites 1, 2, 3, 4 and 6. The lethal limit for rainbow trout and brown trout are shown on the charts. The lethal temperature limit for brown trout is 27.2˚C (Raleigh 1986) and the lethal temperature for rainbow trout is 24.3˚C (Bear 2005).

Temperatures exceeded the lethal limit for rainbow trout for sites 1 and 2 from the end of June through the beginning of August. For site 3 the lethal limit for rainbow trout was exceeded through the month of July. For site 4 the lethal limit for rainbow trout was exceeded from the end of June until the end of August. And, for site 6 the lethal temperature was exceeded one time at the end of July. This site went dry in July and stayed dry for the duration of the study.

Temperatures approached or exceeded the lethal limit for brown trout for site 1 in July. For site 2 the lethal limit was exceeded once for the beginning of June and several times between July and August. The greatest number of lethal temperature exceedances occurred at site 4, particularly from the beginning of June through the beginning of August. Site 6 did not have temperatures that exceeded the lethal limit; however, this site went dry in July and stayed dry for the duration of the study.

Temperatures were roughly similar at all of the sites with the notable exception of site 3, which had markedly cooler temperatures when there was flow. These cooler temperatures are likely attributed to groundwater inflows to the channel upstream of site 3.

Historical temperature data was very limited for the Dry Fork of the Marias. However, the Department had temperature data records from 1975-1978 for portions of the Dry Fork of the Marias River, including the areas upstream and downstream of the confluence with the Tributary. The data was collected by individual sampling events so there is no information on the high, low or average temperatures for these dates. The historical temperature data is shown in Table 5.2.

Table 5.2: Historical Temperature Data for Dry Fork of the Marias River (1976-1980).

Date	Between Highway 91 and I-15	At Highway 91	Above Lagoon Discharge	Below Lagoon Discharge
5/27/76	21.0	22.0	21.0	21.0
8/23/78	---	12.2	---	---
7/18/79	---	---	29.0	24.0
12/07/79	---	---	1.0	1.0
5/13/80	---	20.0	---	---
08/13/80	---	15.7	---	---

Historical temperature data shows that the DFMR reached highs of 24 and 29 ˚C above and below the confluence with the Tributary. At highway 91 temperatures reached 22 ˚C, and at a site between Highway 91 and I-15 the water temperature was 21 ˚C. The historical temperature data is consistent with temperature data collected for the UAA in 2006.

5.2 Flow

Flow results varied by site and month. Flow readings for the discharge pipe were supplied by the City of Conrad. Flow readings provided were for the 30-day average as well as the maximum flow. The 30-day average discharge from the lagoons was chosen for comparison to the instantaneous measurements done at the other sites. Table 5.3 shows the flow readings for each site in cubic feet per second (cfs). Flow data was not provided in Table 5.3 for site 5 since the data was collected by the City of Conrad and measured by a different measuring method. Flow for site 5 for the month of June was 0.88 cfs; 0.59 cfs for July, 0.58 cfs for August, and 0.71 cfs for both September and October.

Table 5.3: Flow measurements (ft3/sec) for sites 1-6 for the months of June-October of 2006.

Site	June	July	August	September	October
Site 1 (upstream confluence, DFMR)	1.74	4.46	5.23	0.28	0.66
Site 2 (downstream confluence DFMR)	2.83	5.11	5.31	0.28	0.82
Site 3 (above confluence on Tributary)	0.29	0.17	0	Low Flow	0.15
Site 4 (Tributary below diversion)	0.39	0.24	Low Flow	0.06	0.08
Site 6 (Tributary above lagoons)	0.49	Low Flow	Dry	Dry	Dry

Site 1 and Site 2: The two sites on the DFMR had water throughout the study. The lowest flow occurred in September for both sites.

Site 3: Flow was measurable for June and July. The site went dry in August and had low flow in September. Flow was lower at this site than in Site 4 with the exception of October, when there was a slight increase in flow.

Site 4: Flow was measured at site 4 for every month except August, when the flow was too low to measure. The site did not go dry for the duration of the study. Flow was very low for the months of September and October, but still measurable.

Site 5: The 30-day average flow was provided by the City of Conrad. Flow was the same for both September and October.

Site 6: Site 6 had measurable flow in June, but then had low flow in July and then went dry for the remainder of the sampling period.

5.2.1 Water Depth

The average depth information for each site is shown in Figure 5.4. The average depth for sites 1 and 2 in the DFMR were the same. Site 6 had the greatest depth, but this site only had measurable depth for the month of June and then it went dry.

Table 5.4: Average monthly depth measurements (feet) for sites 1, 2, 3, 4 and 6.

Site	June	July	August	September	October	Average
Site 1	0.61	0.49	0.79	0.22	0.44	0.51
Site 2	0.67	0.48	0.44	0.52	0.43	0.51
Site 3	0.33	0.34	*	*	0.26	0.31
Site 4	0.36	0.21	*	0.13	0.23	0.23
Site 6	0.81	*	*	*	*	0.81

** Indicates that flow data was not collected due to dry or low flow conditions.*

5.3 Fish

The challenging sampling conditions of portions of the Tributary made it possible to only collect fish at sites 3 and 4. Low flow conditions at site 6 (above the lagoons) prevented electrofishing this area. Fish were counted, identified to species, and then measured for total length. Some fish were preserved and taken back to FWP for archives. Tables 5.5-5.8 shows the species that were captured at each site, the number collected (N), and the percentage of each species collected (% composition). The minimum and maximum total lengths were recorded for each species at sites 2, 3 and 4. This information is shown in Appendix E. Very little data is available regarding the age and size classes of these fish species. Toby Tabor (Montana FWP) explained that the fish that were captured were in the adult life stage (personal communication 2/14/08). None of the fish collected at the sites were in the juvenile or early life stages.

Table 5-5: Fish collected at site 1, upstream of the confluence with the Tributary.
Electrofishing effort for this site was 1615 seconds.

Species	Common Name	N	% Composition
Culaea inconstans	Brook Stickleback	148	37.4
Rhinichthys cataractae	Longnose Dace	124	31.3
Couesius plumbeus	Lake Chub	59	14.9
Catostomus commersoni	White Sucker	36	9.1
Pimephales promelas	Fathead Minnow	16	4.0
Notropis hudsonius	Spottail Shiner	12	3.0
Hybognathus hankinsoni	Brassy Minnow	1	0.3
Total		**396**	**100**

Table 5-6: Fish collected at site 2, downstream of the confluence with the Tributary.
Electrofishing Effort for this site was 1651 seconds.

Species	Common Name	N	% Composition
Culaea inconstans	Brook Stickleback	124	31.2
Couesius plumbeus	Lake chub	108	27.2
Catostomus commersoni	White sucker	60	15.1
Hybognathus hankinsoni	Brassy minnow	40	10.1
Pimephales promelas	Fathead minnow	39	9.8
Rhinichthys cataractae	Longnose dace	19	4.8
Notropis hudsonius	Spottail shiner	7	1.8
Total		**397**	**100**

Table 5-7: Fish collected at site 3 on the Tributary.
Electrofishing effort for this site was 975 seconds.

Species	Common Name	N	% Composition
Culaea inconstans	Brook Stickleback	53	100
Total		**53**	**100**

Table 5-8: Fish collected at site 4 on the Tributary, downstream of the discharge pipe.
Electrofishing effort for this site was 650 seconds.

Species	Common Name	N	% Composition
Culaea inconstans	Brook Stickleback	53	94.6
Pimephales promelas	Fathead minnow	2	3.6
Catostomus commersoni	White sucker	1	1.8
Total		**56**	**100**

Brook stickleback were the most common and abundant fish species found at all the sites. This species is native to Montana and found in the northeastern portion of the state (Montana FWP). They are adaptable in extreme conditions and tolerant of both high alkalinity and acidic waters (Ohio DNR 2006). Brook stickleback are considered a temperate species, and can be found in waters with average temperatures ranging from 4-18°C (39-64.4˚F). The water temperatures in the Tributary and the DFMR averaged 13.7-17.2°C (56.6-62.9˚F), which falls within the tolerable temperature range for the brook stickleback.

Fathead minnows and white suckers were found at all the sites except site 3 in the Tributary. Both of these species are found in the northeastern region of Montana. Fathead minnows can tolerate very low oxygen levels, turbid water, and a wide variety of temperatures (Montana FWP); conditions that are frequently found in prairie environments. White suckers can withstand a wide variety of conditions including turbidity and low oxygen levels (Ohio DNR 2006). They are considered highly adaptable to differing habitats and changing environmental influences, and are relatively tolerant of turbid and polluted waters (Rook 1999). Average temperature requirements are similar for Fathead minnows (0-33°C) and white suckers (0-29°C).

Other species found only in the DFMR include the lake chub, brassy minnow, longnose dace, and the spottail shiner. The lake chub is a temperate minnow, and lives in average water temperatures between 4-25°C (39-77˚ F) (Page 1991). They inhabit virtually any body of water, standing or flowing, large or small (Page 1991).

The brassy minnow is another native fish species found in Plains Rivers, and they are usually found in close association with fathead minnows. They have been known to live in harsh, fluctuating environments subject to summer drying and winter freezing in the western Great Plains and yet may be capable of rapid dispersal and reproduction during the wet season (Scheurer 2003). They have also been found to be tolerant of very low dissolved oxygen and high water temperatures (Scheurer 2003).

Longnose dace are found throughout all three major drainages in Montana. They are very adaptable, and inhabit almost every conceivable habitat: muddy and warm, clear and cold, streams and lakes. Longnose dace are a temperate species, and live in average water temperatures from 4-16°C (39-60˚F) (Robins et al 1991).

The spottail shiner is a non-native fish found in the northeastern region of the state. It was first introduced into Fork Peck Lake as a prey species for walleye, sauger and northern pike, and has since turned up in other waterbodies. Montana FWP (MFISH) lists this species as occupying warmer waterbodies such as the Milk, Tongue, Yellowstone and Marias Rivers, and also several reservoirs. They inhabit waters with average temperatures ranging from 4-24°C (39-75.2˚F) (Page 1991).

5.4 Macroinvertebrates

5.4.1 Macroinvertebrate Functional Group Composition

The macroinvertebrates identified in the samples were those typical of warmwater stream communities. The functional group composition for each site is shown in Appendix F. The dominant macroinvertebrates for sites 1, 2, 3, 4 were "collector gatherers." The following information describes the functional composition of macroinvertebrates for each site.

Site 1: The dominant types of macroinvertebrate for site 1 were the collector gatherers (48.6%), followed by the collector filterers (29.5%), and then shredders (7.6%).

Site 2: The functional group composition for site 2 was similar to that of site 1. The dominant type of macroinvertebrate was collector gatherer (59.3%), followed by collector filterers (22.6%), and then scrapers (11.6%).

Site 3: The dominant macroinvertebrate type for site 3 was the collector gatherers (77.7%), followed by the shredders (15.6%), and then the predators (1.8%).

Site 4: The collector gatherers dominated the macroinvertebrate population at site 4 (59.9%), followed by parasites (27.8%), and then collector filterers (7.7%).

Site 6: The two dominant macroinvertebrate types for site 6 were parasites (48.8%) and the collector gatherers (48.5%).

5.4.2 Macroinvertebrate Tolerance

Table 5-9 shows the following: percentages of EPT (Ephemeroptera + Plecoptera + Trichoptera) taxa richness; percentage of cold stenotherm taxa richness; percentage of sediment tolerant taxa;

the percentage of pollution tolerant taxa, and a rating based on the Hilsenhoff Biotic Index. The definitions of each category are listed below the table, along with an explanation of what was found at the individual sites.

Table 5-9: Percentage of specific macroinvertebrate populations for sites 1, 2, 3, 4 and 6.

	Site 1	Site 2	Site 3	Site 4	Site 6
Ephemeroptera, Plecoptera and Trichoptera (EPT)	9.4%	5.8%	2.1%	0%	0%
Cold Stenotherm	0%	0%	0%	0%	0%
Sediment Tolerant	2.1%	1.0%	29.3%	23.0%	1.6%
Pollution Tolerant	19.5%	45.5%	47.9%	35.9%	3.7%
Hilsenhoff Biotic Index	5.91	7.70	6.77	7.35	6.03

EPT Taxa Richness: the number of distinct taxa within the insect orders Ephemeroptera (mayflies), Trichoptera (caddisflies), and Plecoptera (stoneflies). These orders are considered to be relatively sensitive to pollution and like other groups of macroinvertebrates, are important items in fish diets. EPT richness values generally increase with improving water quality (Terraqua Inc. 2003).

Site 1 had the highest percentage of EPT, followed by site 2 and then site 3. EPT taxa were not found in either site 4 or site 6.

Cold Stenotherm Taxa Richness: the number of taxa that prefer cold water. If cold stenothermic taxa are absent or rare, the community has likely experienced acutely high temperatures (Terraqua Inc. 2003).

None of the sites had cold stenotherm taxa.

Sediment Tolerant Taxa: this is the relative abundance of taxa tolerant of fine sediment. A high percentage of sediment tolerant taxa suggest unusually high fine sediment loading (Terraqua Inc. 2003).

Sites 1 and 2 had similar amounts of sediment tolerant taxa. The highest percentage was at site 3 and site 4.

Pollution Tolerant Taxa: percentage of taxa that are considered tolerant of various pollution.

Sites 1 and 6 had the lowest amount of pollution tolerant taxa. The percentage of these taxa was similar for sites 2 and 3, and the percentage was slightly lower at site 4.

Hilsenhoff Biotic Index: an index that looks at animal communities and assesses the degree of organic pollution. The index was originally developed in 1977 by Dr. William Hilsenhoff of the University of Wisconsin. A rating of 3.51-4.50 indicates very good water quality; 4.51-5.50 indicates good water quality; 5.51-6.50 indicates fair water quality; 6.51-7.50 indicates fairly poor conditions, and 7.51-8.50 indicates poor water quality conditions.

Sites 1 and 6 had fair water quality based on the index. Sites 3 and 4 had fairly poor conditions, and site 2 had poor water quality conditions.

5.5 Water Chemistry

A complete set of results for these parameters, including the calculated nitrogen and calculated organic nitrogen can be found in Appendix G. Data indicates that there is a pattern of dilution between sites 4 and 3 for TKN and total nitrogen. This supports the assumption that the water in Welch Coulee is supplementing flow in the Tributary at site 3.

5.5.1 Ammonia

Ammonia values were calculated for each of the sites and are listed in Appendix H. The acute limit for ammonia was exceeded at Site 5 during the months of July, September and October. The chronic ammonia limits were exceeded every month at Sites 4 and 5.

5.6 Other Parameters

Other parameters measured were electrical conductivity, temperature, dissolved oxygen and pH. Results for these parameters can be found in Appendix I. The YSI 85 (previously YSI 556) meter was used to measure electrical conductivity, temperature and dissolved oxygen. The Oakton Waterproof pH Tester 1 was used to measure pH.

5.6.1 Electrical Conductivity

Conductivity readings were available for every month of the study except for June. Conductivity results show that readings were similar at both sites in the DFMR for every month they were sampled. For every month conductivity increased downstream from site 5 to site 4 on the Tributary. Site 3 had the highest conductivity readings of all the sites for every month except August, when there was no data since it was dry.

5.6.2 pH

The pH readings varied by month and site. In the DFMR the pH ranged from 8.0-8.4. In the Tributary the pH ranged from 7.4-9.3. The reading of 9.3 was the highest recorded pH and it was at the discharge pipe (Site 5). Per the ARM, waterbodies classified B-2 and B-3 both require pH levels within the range of 6.5 to 9.0. The induced variation must be less than 0.5 pH unit. The pH readings for both the Tributary and the DFMR were within the limits of the standards.

5.6.3 Dissolved Oxygen

The equipment used to measure dissolved oxygen was calibrated for elevation and temperature. Dissolved oxygen concentrations varied by site and month. In the DFMR the dissolved oxygen ranged from 7.6-12.2 mg/L. In the Tributary the dissolved oxygen ranged from 0.54-16.2 mg/L. The lowest reading of 0.54 was found at site 4 during the month of August.

The standards require a minimum of 4.0 mg/L of dissolved oxygen for waters classified B-2 when early life stages of fish are not present. For B-3 waters the minimum dissolved oxygen requirement is 3.0 mg/L where early life stages of fish are not present. None of the fish collected in this study were in the early life stage (personal communication with Toby Tabor 2/14/08), therefore the standard of 4.0 mg/L applies.

6.0 CONCLUSIONS

This section will briefly discuss conclusions pertaining to temperature and fish, macroinvertebrates, flow, and other parameters.

6.1 Temperature and Fish

Temperatures were consistently very similar for both sites in the DFMR throughout the study. The temperature decrease in the Tributary between site 4 and 3 supports that the Tributary is receiving water from a groundwater source below Welch Coulee. If the only source of water to this site was from the discharge we would expect that the temperature would be the same as or warmer than site 4.

Temperatures measured in both the DFMR and the Tributary were often too high to support the propagation and growth of salmonids. Brown trout and rainbow trout are two of the more common salmonids found in Montana, and these exotics are considered more tolerant than other species. The lethal temperature limit for brown trout is 27.2˚C (Raleigh 1986) and the lethal temperature for rainbow trout is 24.3˚C (Bear 2005). The highest temperature in the Tributary reached 30.6˚C; far above the lethal limit for both brown trout and rainbow trout. High temperatures in the DFMR reached 27.5˚C, which is also lethal to both trout species.

The optimal growth temperature for rainbow trout is 13.1˚C (Bear et al 2007). Temperatures between 12-19ºC result in optimal growth of juvenile brown trout (Ojanguren et al. 2001) and temperatures that are greater than 19ºC results in visible thermal stress (Elliott 1981). Average temperatures in the DFMR were approximately 17ºC, which was above the optimal growth temperature for rainbow trout and at the higher end for optimal growth of brown trout.

Based on the temperature data collected in this study it is not surprising that salmonids were not found anywhere in the Tributary or the DFMR. Historical data is consistent with temperatures observed in this study. The temperatures exceeded lethal limits for two tolerant salmonid species. Average temperatures often exceeded the optimal growth temperature for rainbow trout, and temperatures were at the high end of the optimal growth temperature for brown trout.

The temperature and fish data suggest that the appropriate use support for the Tributary and the DFMR should be for non-salmonid fishes. This is consistent with the 1981 decision to downgrade the area of the DFMR approximately ½ mile from the confluence with the Tributary from a B-2 to a B-3. Salmonids were not found in 1981 and they were not found in 2006. The community of fish in the Tributary and the DFMR today represents a prairie stream fish assemblage, which will be discussed later in Sections 7.1.1 and 7.1.2.

6.2 Macroinvertebrates

The low percentage of EPT taxa at sites 1, 2, and 3 and their non-existence at sites 3, 4 and 6 are most likely a result of the water quality. Site 1 ranked the highest in water quality according to the Hilsenhoff Biotic Index, and this site also had the highest percent of EPT. According to Terraqua (2003) EPT richness values generally increase with improving water quality.

The lack of cold stenotherms is consistent with the high water temperatures collected in this study and documented in historical records. If the DFMR and the Tributary were truly coldwater waterbodies then we would expect cold stenotherms to be present. Since there is an absence of cold stenotherms it is most likely that high water temperatures are preventing the attainment of this use.

Sediment tolerant taxa in the DFMR were very low, which indicates that this portion of the waterbody is not receiving high fine sediment loading. While the DFMR had silt and mud it also had some cobble and riffles, and this is reflected in the macroinvertebrate community. The dominant substrate in the Tributary was mud and silt, which explains the high percentage of sediment tolerant taxa at these sites.

The percentage of pollutant tolerant taxa was lowest at site 1, which is consistent with the percentage of EPT. This site is above the confluence with the Tributary. The pollutant tolerant taxa are similar for sites 2 and 3, which, due to the nature of some of the water in the Tributary is expected.

In summary, the absence of cold stenotherms suggests that both the Tributary and the DFMR reach temperatures that are too warm to support these taxa. The taxa present in both the Tributary and the DFMR appear to be associated with the water temperature as well as the substrate.

6.3 Flow

The flow data collected in this study indicates that the Tributary experiences water loss and gains, particularly between site 3 and 4. For example, the flow from the discharge was greatest for the months of September and October, yet site 4 experienced very low flow. Another example is the month of October, where flow was greater at site 3 than site 4. Flow data indicate that flow in the Tributary is attributed to more than the lagoon discharge.

We believe that this Tributary would be perennial in the absence of the Conrad lagoon discharge. The Tributary gains flow from groundwater as well as Welch Coulee, and appears to lose flow in places to the groundwater as well as to water withdrawal.

6.4 Water Chemistry

The ammonia values were high, especially at sites 4 and 5. The high ammonia results for these sites highlight the need for the planned lagoon system upgrade by the City of Conrad.

There were dramatic changes in water chemistry downstream of the lagoon discharge. Total nitrogen values declined in the downstream reaches of the Tributary whereas conductivity increased. The mean total nitrogen values were compared for sites 3 and 4. Site 4 averaged 13 mg/L whereas site 4 averaged 4 mg/L. We believe this to be another indication of the degree of water exchange with groundwater.

7.0 BENEFICIAL USES

7.1 Existing Beneficial Uses

This study found the following existing uses in the Tributary and the DFMR:
- Non-salmonid fish species and associated aquatic life
- Agriculture
- Industry
- Waterfowl and furbearers

While the Tributary and the DFMR are not considered popular areas for recreation, bathing or swimming, there is nothing that would prevent these activities from taking place. Therefore, there is the potential for the Tributary and the DFMR to support these uses. And, with proper treatment (conventional) the water could be used for drinking, culinary and food processing purposes. Therefore, the Tributary and the DFMR are meeting their designated beneficial uses with the exception of one thing; the marginal propagation and growth of salmonid fishes.

The existing and potential support uses for the Tributary and the portion of the DFMR studied in this project suggest that a B-3 classification is more appropriate than B-2. Reclassifying this portion of the DFMR and the Tributary as a B-3 will require removing a designated use.

As per 40 CFR §131.10(g)(1) of the CWA, states may remove a designated use if they can demonstrate that attaining the designated use is not feasible because of "naturally occurring pollutant concentrations prevent the attainment of the use."

The results from this study suggest misclassification since data suggests that water temperatures are too warm to support the marginal propagation and growth of salmonid fishes. The Department believes that the factor preventing the attainment of a coldwater or salmonid fish population is temperature.

In order to provide further support for the misclassification a B-3 reference site was chosen to depict use support in a similar waterbody.

8.0 REFERENCE SITE COMPARISON

The EPA defines a reference site as a “specific locality on a waterbody which is unimpaired or minimally impaired and is representative of the expected biological integrity of other localities on the same waterbody or nearby waterbodies.” A reference site was used in this study to compare conditions within the Tributary and the DFMR to a site with minimal to no human disturbance. The purpose for the comparison was to help determine whether the fish community found in the Tributary and the DFMR was indicative of another waterbody in the same ecoregion.

8.1 Associated Fish Communities

As discussed in section 2.4.1 and 2.4.2, the DFMR and the Tributary are located in the “Northwestern Glaciated Prairie Ecoregion.” The DFMR is considered a “Northern Glaciated Prairie Stream” ecosystem. The resident fish community in this ecosystem is typically dominated by the Core Prairie Stream and the Brook Stickleback Assemblage. In clear, non-degraded streams, members of the Northern Redbelly Dace Assemblage can also be found in this ecosystem.

Species found within the Core Prairie Stream Assemblage consist of fathead minnow, longnose dace, white suckers and lake chub (Stagliano 2005). Species of the Brook Stickleback Assemblage consist of brook stickleback, Iowa darters, and brassy minnows.

The location and attributes of the Tributary make it a “Northern Glaciated Intermittent Stream Ecosystem.” The fish assemblages found in the Northern Glaciated Intermittent Stream Ecosystem include both the Core Prairie Stream Assemblage and the Brook Stickleback Assemblage. Although, more typically this community will be co-dominated by fathead minnows and brook sticklebacks only, and in truly degraded or non-vegetated systems, just fathead minnows.

8.2 Fish Populations in Adjoining Tributaries

There are several tributaries upstream of I-15 on the DFMR (see Table 2.1) A review of the fish data from the Montana Fisheries Information System show that the adjoining tributaries support non-salmonid fish species or do not support any fish. Table 8.1 depicts the fish species information for the tributaries to the DFMR upstream of I-15 where fish have been sampled. None of the fish species sampled in these tributaries are salmonid species. The fish community found in Big Flat Coulee was nearly identical to that found in the DFMR.

Table 8.1: Associated fish species for adjoining tributaries to the DFMR upstream of I-15.

Tributary Name	Associated Fish Species
Big Flat Coulee	**brook stickleback, longnose dace, white sucker, spottail shiner, lake chub, fathead minnow**
Spring Creek	**brook stickleback**
Middle Fork Dry Fork of Marias River	**brook stickleback, fathead minnow, lake chub, white sucker**
South Fork Dry Fork of Marias River	**brook stickleback, fathead minnow, lake chub, white sucker, brassy minnow, longnose dace**

8.3 Reference Site Selection

A reference site for the DFMR was picked from a reference site list compiled by Suplee et al (2005). The site was chosen by selecting a site in the Northwestern Glaciated Plains Ecoregion. The site chosen was Woody Island Coulee, a tributary of Cottonwood Creek located in Blaine County. Woody Island Coulee is a 3rd order stream and located in an area managed by the Bureau of Land Management (BLM) that is occasionally grazed by livestock. This site was selected above because 1.) It is a B-3 stream and 2.) This particular waterbody has fish assemblage data collected for a different project (Stagliano 2005).

Woody Island Coulee has two expected fish assemblages; the Core Prairie Stream and the Brook Stickleback fish assemblage. It also has an expected Northern Redbelly Dace fish assemblage, but the only fish species observed from that assemblage was a northern redbelly dace.

According to Stagliano (2005), fish found in the Core Prairie Stream assemblage include the fathead minnow, longnose dace, white sucker and the lake chub. All four of these species were found in the DFMR and site 4 of the Tributary. Species indicative of the “Brook Stickleback” assemblage include the brook stickleback, the Iowa darter, and the brassy minnow. Brook stickleback were found at every site sampled. The Iowa darter was not found in any of the sites but the brassy minnow was found at sites 1 and 2 on the DFMR.

The common traits that these two fish assemblages share are that all of these fish are able to withstand extreme conditions such as low dissolved oxygen, warm water temperatures, low flow and turbidity.

Stagliano (2005) compared the expected and observed fish assemblages at Woody Island Coulee from two sites. Table 8.1 shows the results for the expected and observed fish assemblages for Woody Island Coulee, the Tributary and the DFMR.

Table 8.2: Expected and observed fish assemblages for Woody Island Coulee, the DFMR and the Tributary.
Where “X” indicates that the species was observed and “--” indicates that the species was absent.

Expected Species Assemblages*	Observed Species Assemblage Woody Island Coulee (sites 1 and 2)	Observed Species DFMR (sites 1 and 2)	Observed Species Tributary (sites 3 and 4)
Fathead Minnow	**X**	**X**	X
White Sucker	**X**	**X**	X
Longnose Dace	**--**	**X**	--
Lake Chub	**X**	**X**	--
Brook Stickleback	**X**	**X**	X
Iowa Darter	**X**	**--**	--
Brassy Minnow	X	X	--

**Expected species assemblage includes both Core Prairie Stream and Brook Stickleback assemblages.*

The observed species were almost the same for the reference site and the DFMR. The only difference is that the reference site was missing longnose dace, whereas the DFMR was missing the Iowa darter.

The observed fish species in the Tributary are consistent with the description of a Northern Glaciated Intermittent Stream Ecosystem (Stagliano 2005), with the two most common species being the fathead minnow and the brook stickleback.

The fish assemblages in the DFMR and the Tributary are very similar to the fish assemblages in the reference site. Salmonid species were not found in any of these waterbodies, and the close resemblance to the reference site suggests that the DFMR and the Tributary are misclassified and should be classified as B-3.

Lastly, although detailed habitat information was not collected for this study, it is the professional judgment of the field staff that the habitat in the DFMR and the Tributary would not support the marginal growth and propagation of salmonids. The substrate consisted primarily of mud and silt, which are not suitable spawning habitat for salmonid fish. Furthermore, woody debris and pools were both lacking for the Tributary and the DFMR. The absence of these two critical habitat components would make it difficult for salmonids to survive, particularly in the warmer months when temperatures exceed upper lethal limits.

9.0 RECOMMENDATIONS

The UAA addressed the objectives in Section 3.1 and provided the following conclusions:

1. The Tributary is perennial;
2. The appropriate use support for the Tributary and this portion of the DFMR is that of a B-3 waterbody; and
3. Natural high water temperatures are preventing the attainment of designated use for the marginal growth and propagation of salmonids; and
4. The data and information collected suggest misclassification and this recommendation will be presented to the BER.

The Department is recommending that the portion of the DFMR and the Tributary studied in this UAA be reclassified as B-3. Data collected in this study demonstrated that the aquatic life and fishes in both waterbodies are indicative of a warm water fishery. The comparison of the reference site to these waterbodies supports this assumption.

The decision to lower the classification was prompted after data collected in this study showed that this area is not capable of supporting the propagation and growth of salmonids due to naturally occurring warm water temperatures. The Department believes that salmonids were not historically supported in the study area, and that this is not a viable use support, as supported by existing natural temperatures not influenced by human sources, ecoregion data, and reference site data.

All resources were exhausted in an attempt to locate historical documents that would depict the conditions of the DFMR and the Tributary prior to 1955. Maps, historical archives, photographs and correspondence with local conservation groups failed to produce any historical conditions for the Tributary and the DFMR. The only information available for the DFMR was sporadic temperature data, which show high temperatures above and below the confluence from 1976-1980. In lieu of this information the reference site was used to compare conditions for a waterbody in the same ecoregion with little to minimal impact or impairment. Since the fish assemblages in the DFMR and the Tributary were nearly identical to the reference site it was concluded that the use attainments for these waterbodies is for warm water fish fishes and not salmonids.

Furthermore, associated tributaries of the DFMR do not support salmonid fishes. Fish data from these tributaries are the same species that were collected in the DFMR and the Tributary, and there are no records of salmonids for any of the adjoining tributaries.

The authority to lower the classification is under MCA 75-5-302(1). Furthermore, the Department believes that the marginal growth and propagation of salmonids is not possible due to naturally occurring high water temperatures. Temperature is serving as a pollutant and preventing this designated use per 40 CFR §131.10(g)(1) of the CWA. The Department does not believe that the high water temperatures are a result of point or nonpoint sources, but rather from natural sources. Historical temperature data supports this belief.

The proposed reclassification would apply to the portion of the DFMR from Highway 91 to the confluence with the Marias River. The language in ARM 17.30.610(1)(d)(iii) currently reads:

“Dry Fork Marias River (mainstem) from Interstate 15 crossing near Conrad to Marias River”

The proposed language in the November 2007 rulemaking package would read as follows:

“Dry Fork Marias River (mainstem) from Highway 91 near Conrad to Marias River and all adjoining tributaries”

The new language would move the boundary for the classification change approximately 0.67 mile upstream. Since only this portion of the DFMR was studied this is the only portion of the stream that will be reclassified. The additional language “and all adjoining tributaries” includes the Tributary.

It is the belief of the WQS Section that a B-3 classification is appropriate and that adopting this classification would protect all beneficial uses of this portion of the DFMR and the Tributary. Furthermore, the reclassification would help DEQ write discharge permits for the City of Conrad wastewater lagoons to meet the most appropriate level of water quality protection.

10.0 REFERENCES

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APPENDIX A – WATER RIGHT INFORMATION FOR THE TRIBUTARY AND WELCH COULEE

Current Water Rights Holder	Use	Waterbody	Flow	Original Claim Date
Helen and Everett Elliot	Irrigation	Welch Coulee	Unknown	**July 11, 1902**
Helen and Everett Elliot	Irrigation	Welch Coulee	1000 gpm	**May 9, 1945**
Richard and Mary Jane Kinyon	Stock	Tributary of Dry Fork Marias River	20 gpm	**April 11, 1913**
Bernice and Clifford Wright	Stock	Tributary of Dry Fork of Marias River	360 gpd	**April 11, 1913**

APPENDIX B - SITE LOCATION AND DATA COLLECTION TYPE

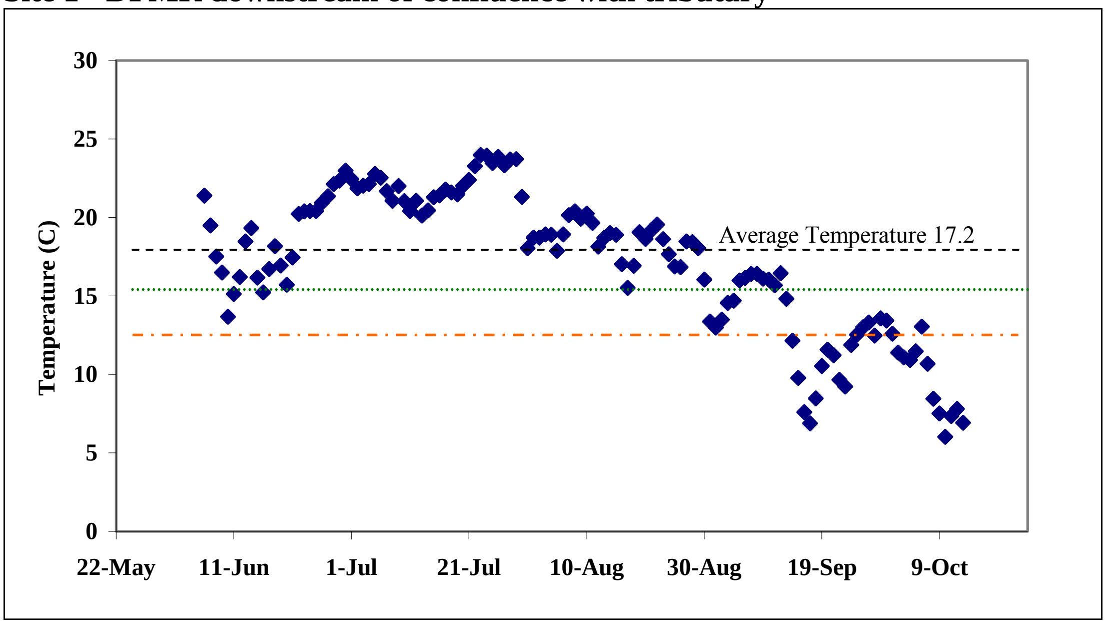
Site	Latitude	Longitude	Altitude	Temperature Logger	Macroinvertebrates	Fish Collection
1	48.21497	-111.94507	3399	Yes	Yes	Yes
2	48.21502	-111.94474	3419	Yes	Yes	Yes
3	48.21005	-111.94187	3430	Yes	Yes	Yes
4	48.2077	-111.92855	3440	Yes	Yes	Yes
5	48.20745	-111.92567	3474	No	No	No
6	48.20307	-111.91807	3466	Yes	Yes	No

Location and data collection type for each of the six sites along the DFMR and the Tributary.

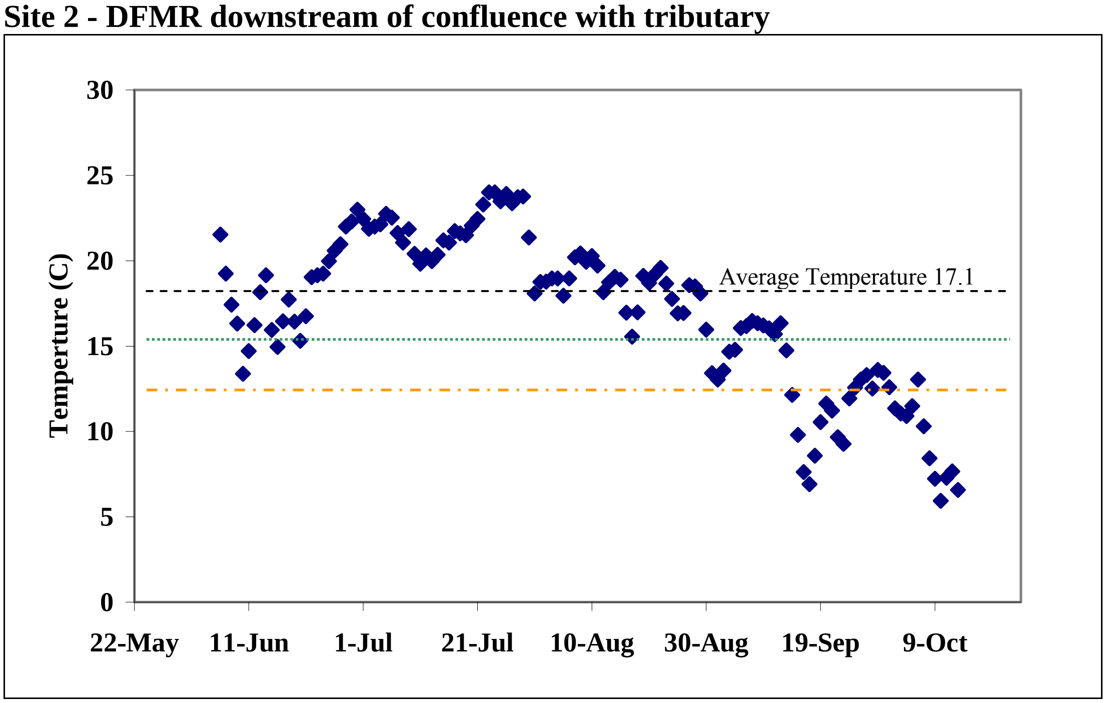
APPENDIX C - SEVEN DAY AVERAGE TEMPERATURE DATA

The following charts show the seven day average temperatures for sites 1, 2, 3, 4 and 6. The averages were obtained by calculating the daily average temperatures, and then calculating the average temperature for every seven day (days 1-7, 8-15, etc.). The data was collected from the temperature loggers placed at these sites. The optimal growth temperatures were provided for brown trout (green line, 15.5˚C) and rainbow trout (orange line, 13.1˚C).

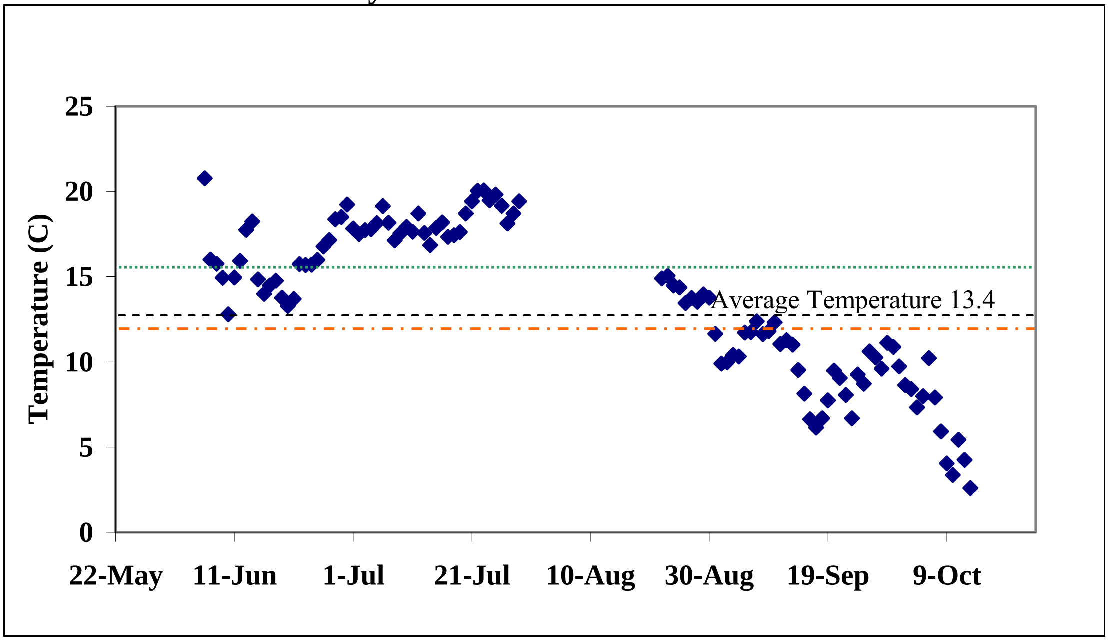
Site 1 - DFMR downstream of confluence with tributary



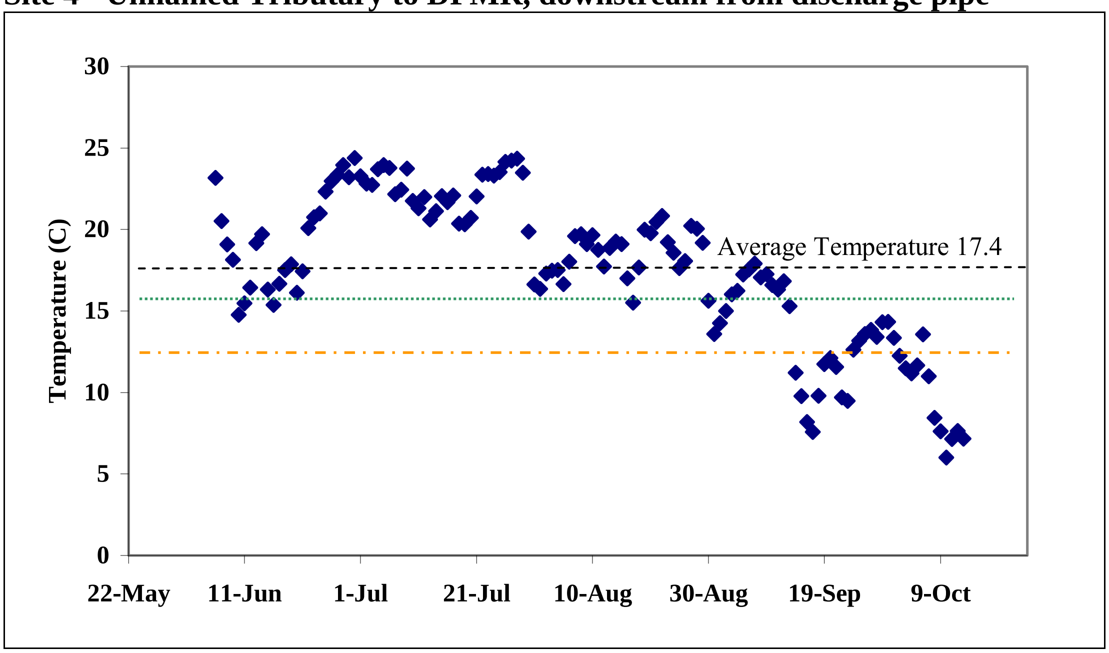
Site 2 - DFMR downstream of confluence with tributary



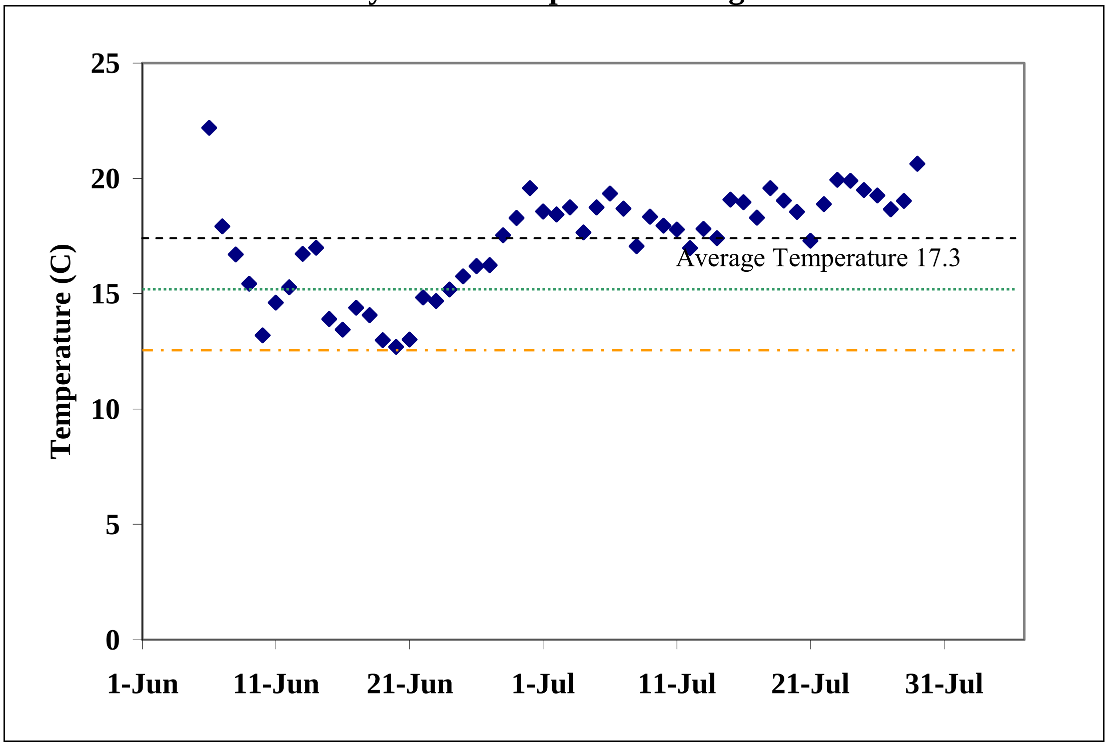
Site 3 - Unnamed Tributary to DFMR



Site 4 - Unnamed Tributary to DFMR, downstream from discharge pipe



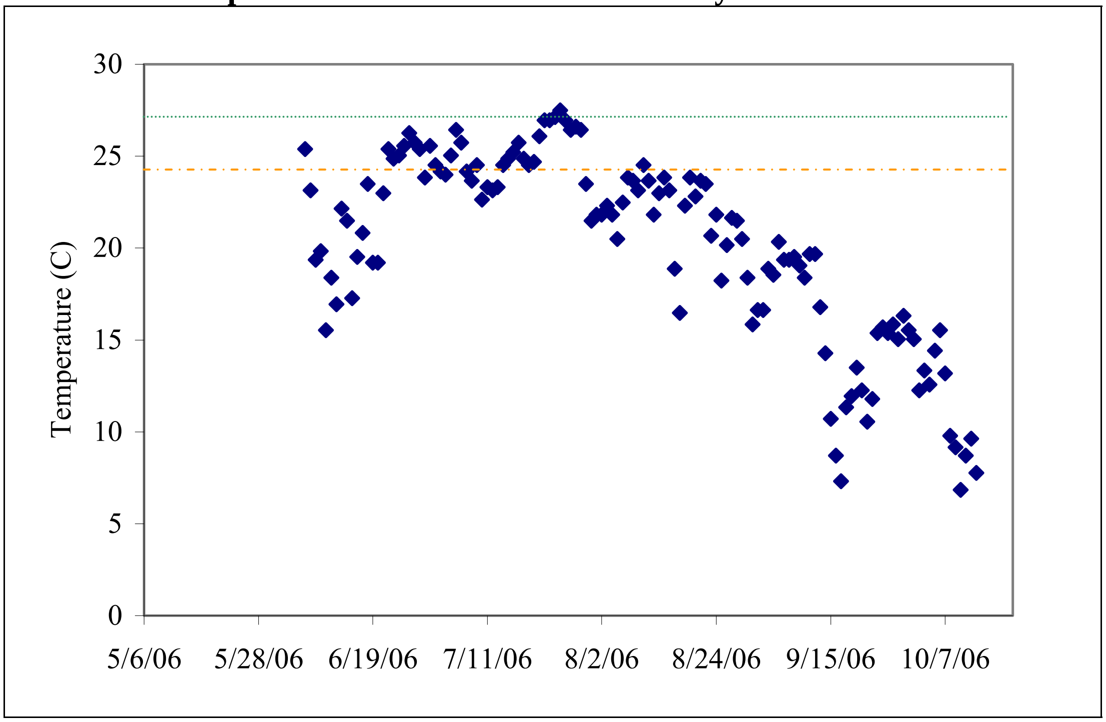
Site 6 - Unnamed Tributary to DFMR upstream of lagoons



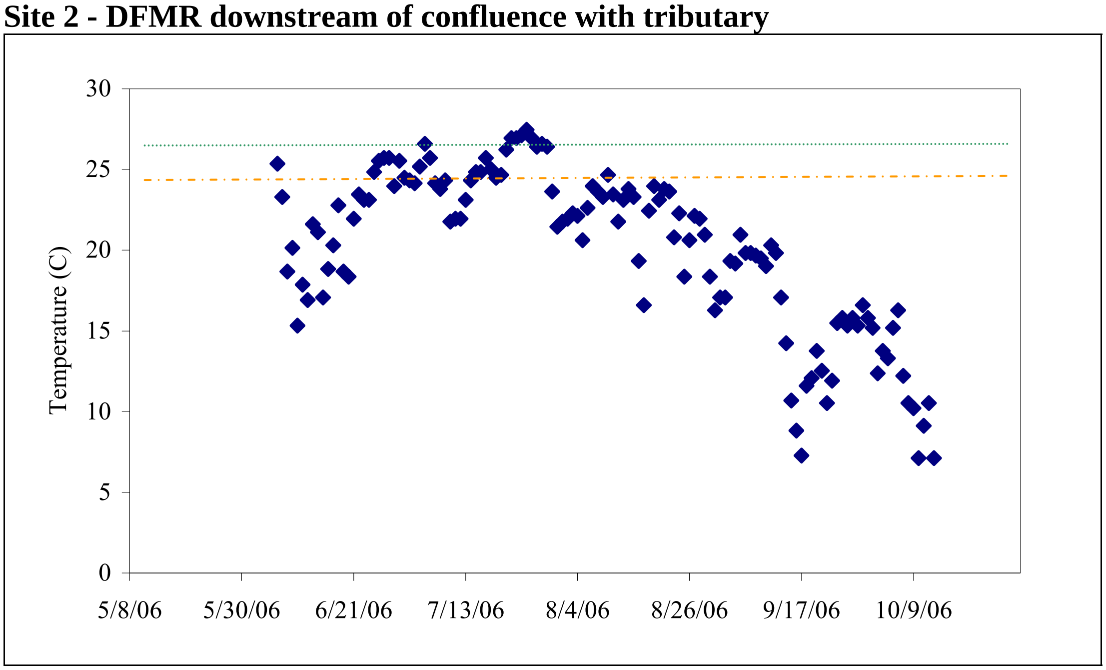
APPENDIX D - DAILY MAXIMUM TEMPERATURE DATA

The following charts show the daily maximum temperatures for sites 1, 2, 3, 4 and 6. The data was collected from the temperature loggers placed at these sites. The lethal limit temperatures are provided for brown trout (green line, 27.2˚C) and rainbow trout (orange line, 24.3˚C).

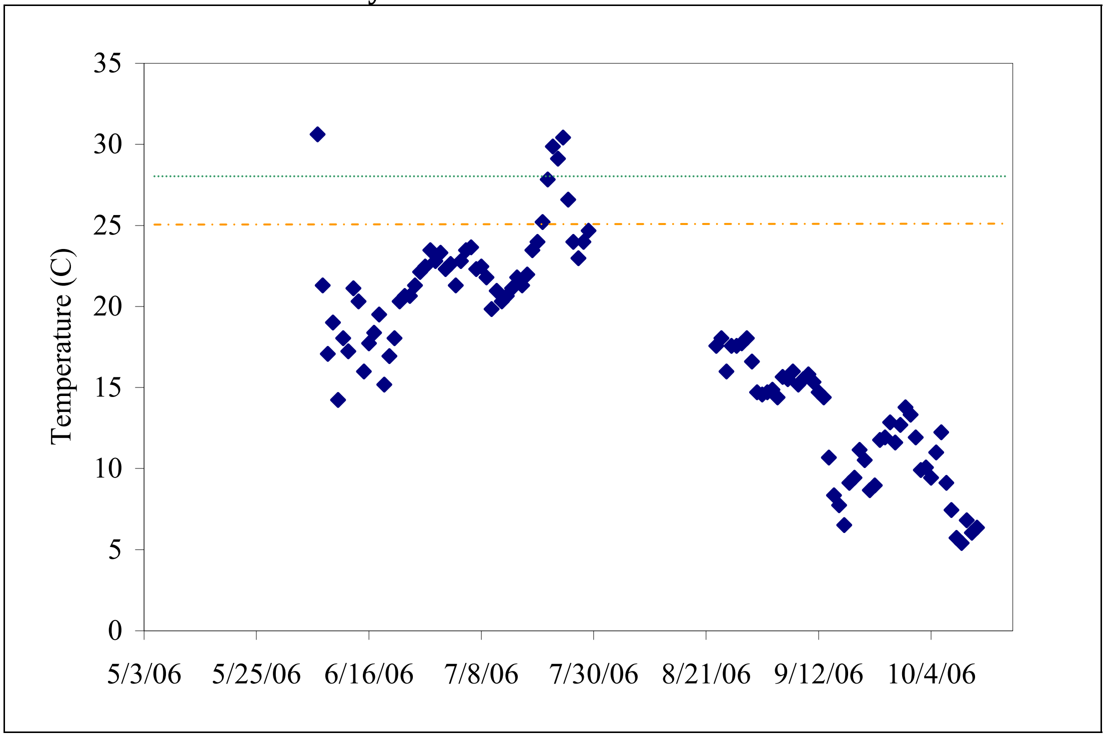
Site 1 - DFMR upstream of confluence with tributary



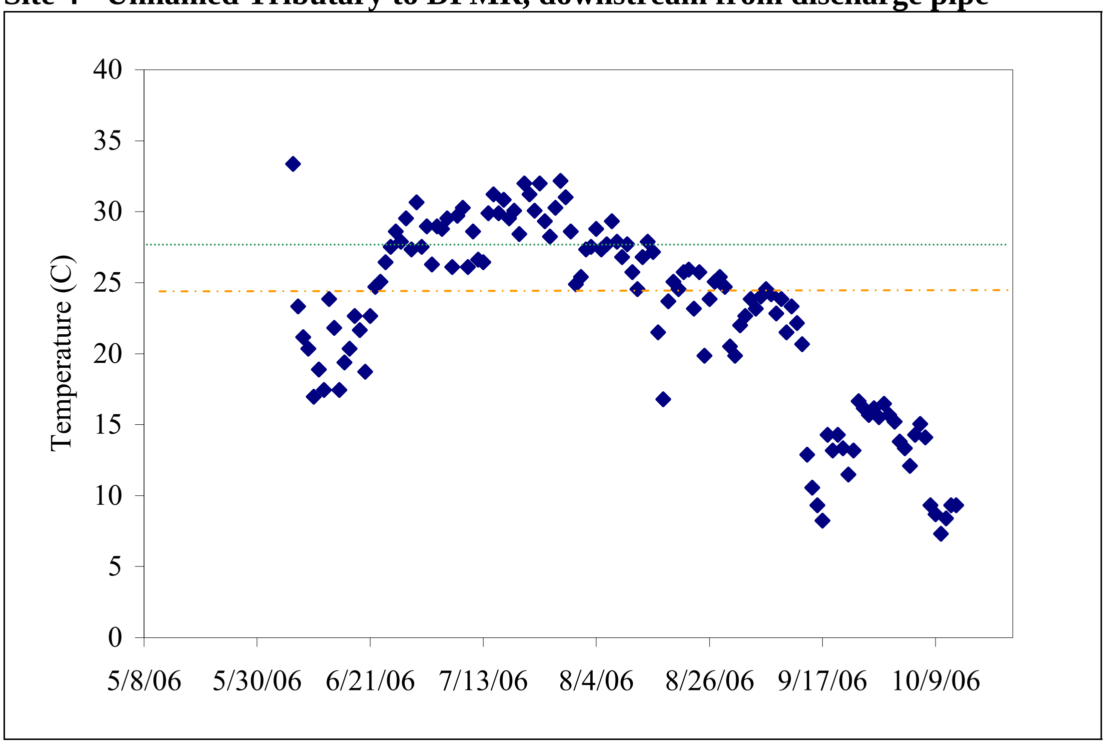
Site 2 - DFMR downstream of confluence with tributary



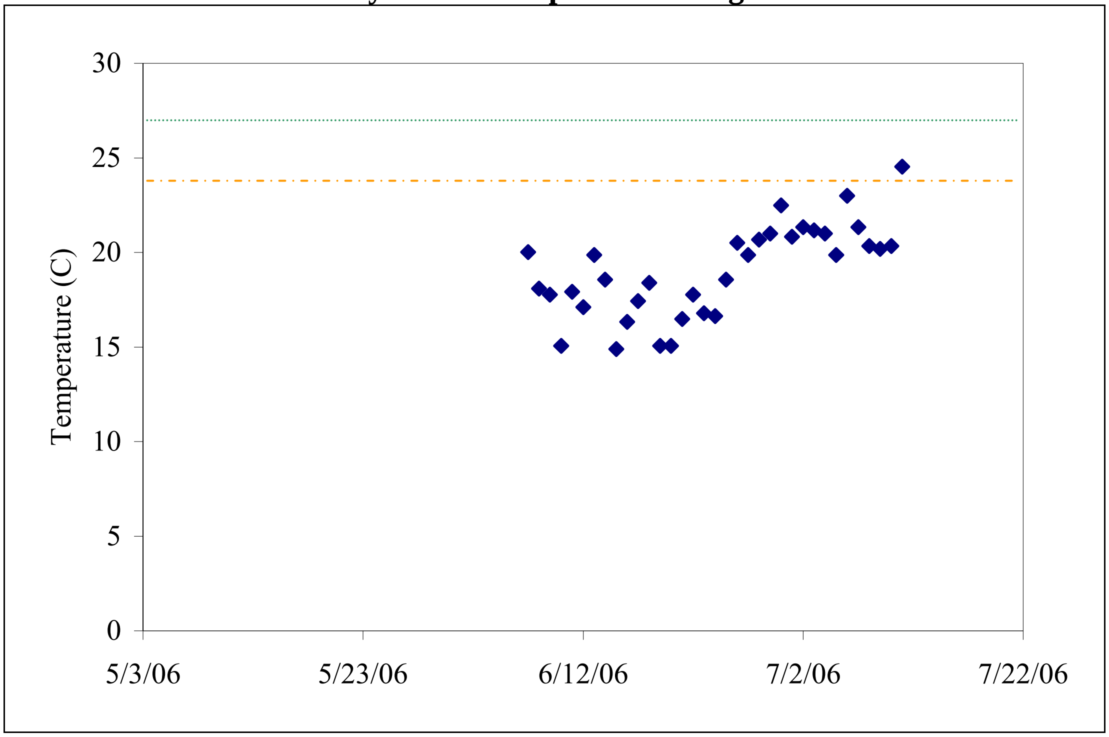
Site 3 - Unnamed Tributary to DFMR



Site 4 - Unnamed Tributary to DFMR, downstream from discharge pipe



Site 6 - Unnamed Tributary to DFMR upstream of lagoons



APPENDIX E - TOTAL LENGTH DATA FOR COLLECTED FISH

The following data is for the fish collected in the Dry Fork of the Marias River and the unnamed Tributary. Total length was collected for each fish species. Total length data was not available for site 1.

Site 2 - Dry Fork of the Marias River

		Total Length (mm)		
Species	N	Min	Max	Mean
brassy minnow	40	39	74	55.4
brook stickleback	124	42	67	51.2
fathead minnow	39	36	71	45.5
lake chub	108	58	125	78.1
longnose dace	19	42	94	55.7
spottail shiner	7	36	47	43.0
white sucker	60	62	238	104.7
northern crayfish	5	-----	-----	-----

Site 3 - Unnamed Tributary to the Dry Fork of the Marias River

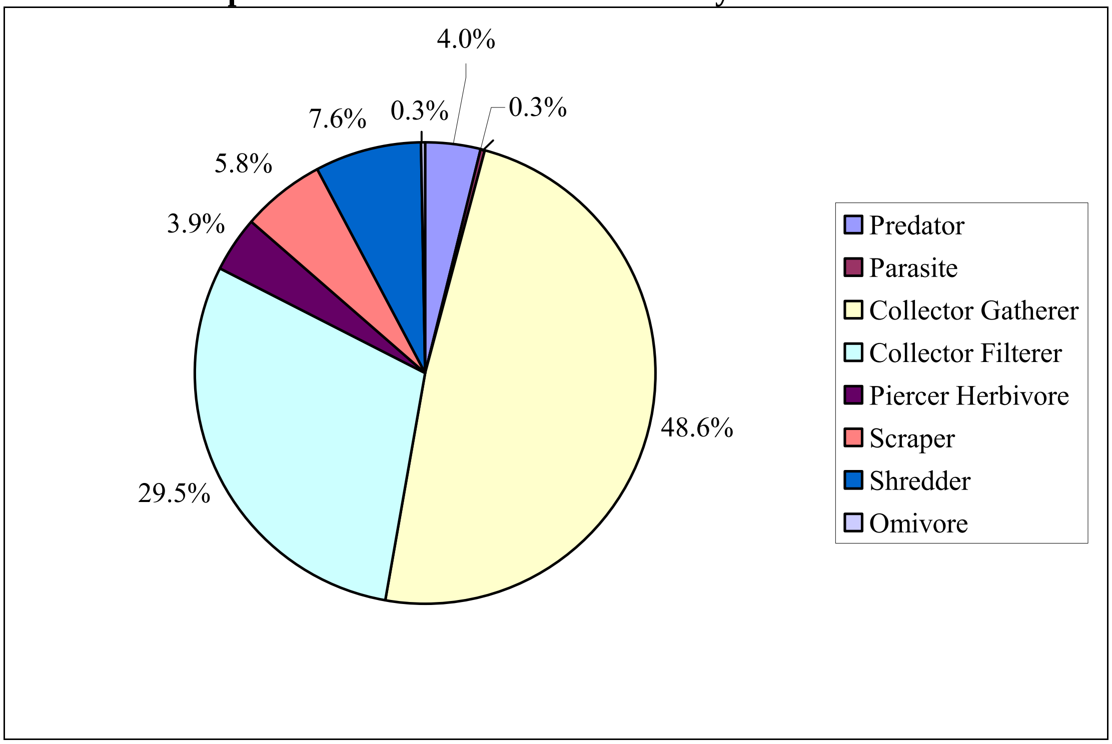
		Total Length (mm)		
Species	N	Min	Max	Mean
brook stickleback	53	37	62	49.5

Site 4 - Unnamed Tributary to the Dry Fork of the Marias River

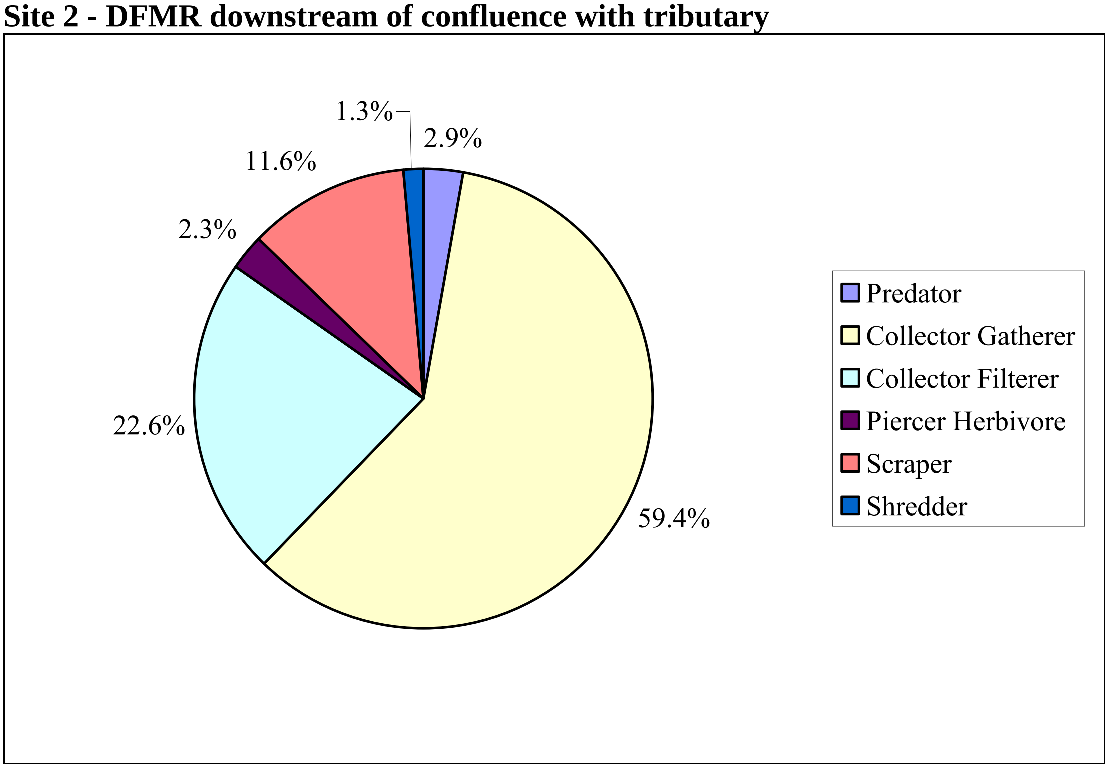
		Total Length (mm)		
Species	N	Min	Max	Mean
brook stickleback	53	42	64	50.2
fathead minnow	2	43	55	49.0
white sucker	1	32	32	32.0

APPENDIX F – FUNCTIONAL COMPOSITION OF MACROINVERTEBRATES COLLECTED AT SITES 1, 2, 3, 4 AND 6

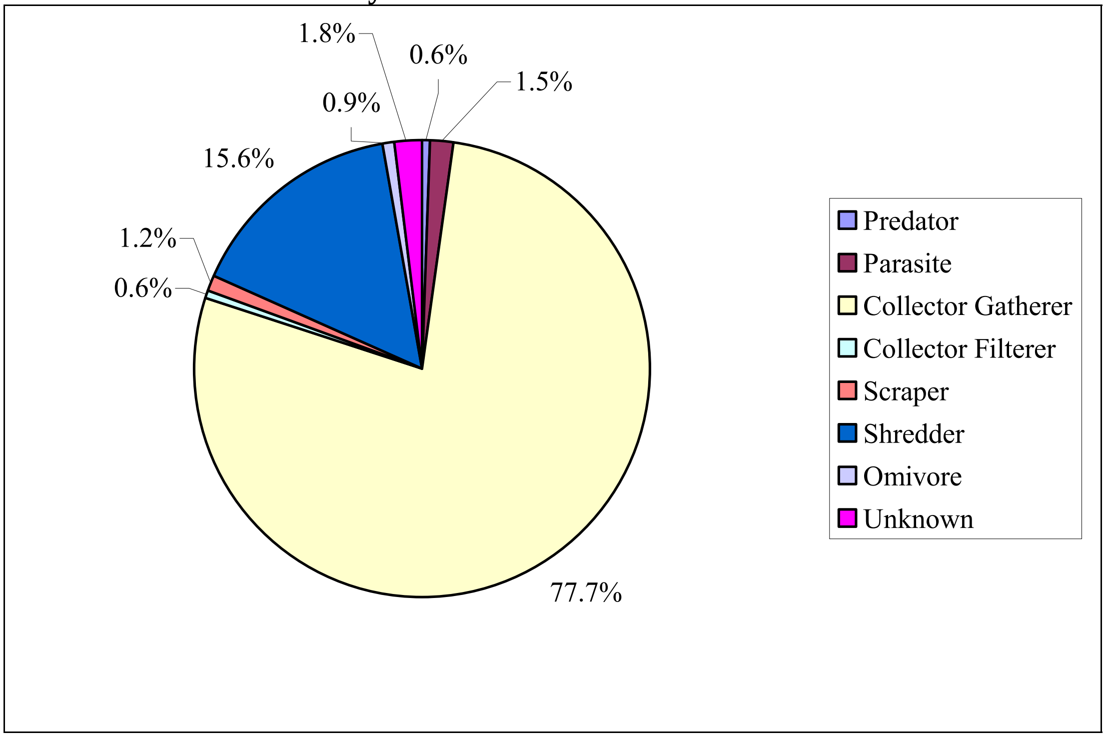
Site 1 - DFMR upstream of confluence with tributary



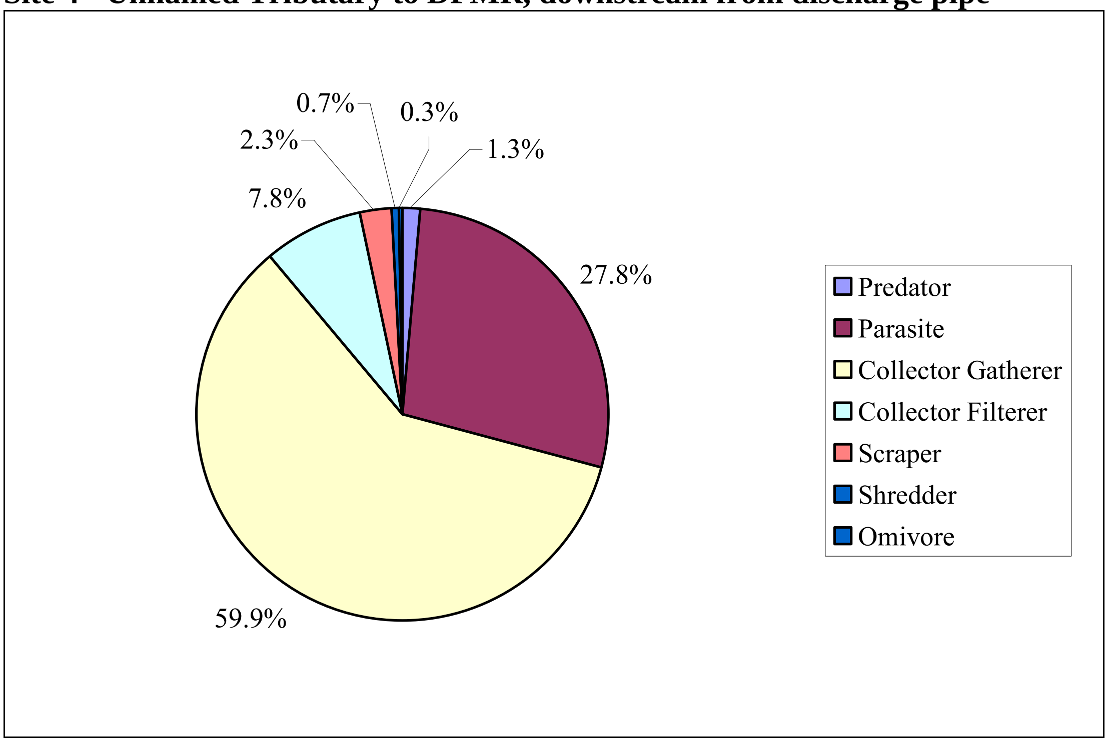
Site 2 - DFMR downstream of confluence with tributary



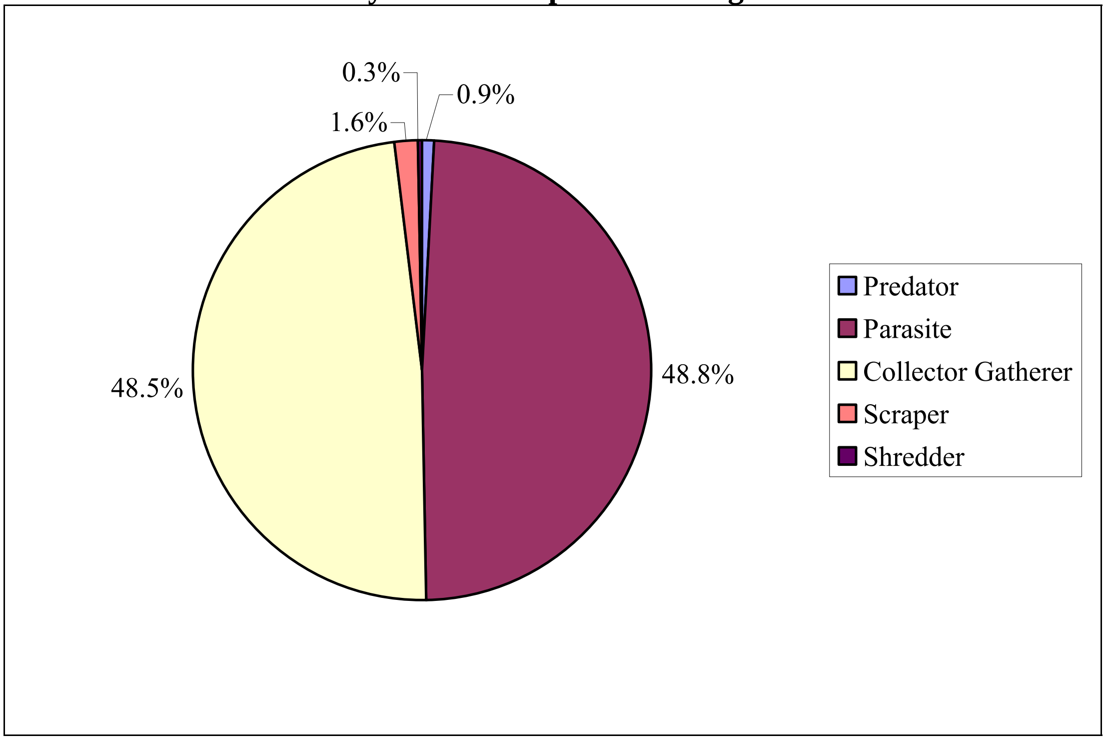
Site 3 - Unnamed Tributary to DFMR



Site 4 - Unnamed Tributary to DFMR, downstream from discharge pipe



Site 6 - Unnamed Tributary to DFMR upstream of lagoons



Appendix G – Results for NO3, NH3, PO4, TKN

June

Site	TKN	NO2+NO3	Ammonia	Total N	Organic N	Total P
Site 1	0.24	0.0025*	0	0.2425	0.24	0.015
Site 2	0.48	0.007	0	0.487	0.48	0.786
Site 3	2.6	0.563	0.05	3.163	2.55	7.31
Site 4	13.9	0.042	7.9	13.942	6	5.16
Site 5	16.4	0.29	9.77	16.429	6.63	5.17
Site 6	0.92	0.025	0	0.945	0.92	0.167

July

Site	TKN	NO2+NO3	Ammonia	Total N	Organic N	Total P
Site 1	0.42	0.0025*	0.02	0.4225	0.4	0.069
Site 2	0.51	0.005	0.02	0.515	0.49	0.243
Site 3	5.21	1.41	1.32	6.62	3.89	8.87
Site 4	8.58	0.231	1.41	8.811	7.17	3.6
Site 5	11.2	0.822	3.13	12.022	8.07	3.5
Site 6	1.0	0.011	0.06	1.011	0.94	0.242

August

Site	TKN	NO2+NO3	Ammonia	Total N	Organic N	Total P
Site 1	0.35	0.0025*	0.0	0.3535	0.35	0.06
Site 2	0.35	0.0025*	0.01	0.3525	0.34	0.05
Site 4	15.2	0.015	3.22	15.215	11.98	3.16
Site 5	18.3	0.135	3.17	18.435	15.13	4.19

**Sites 3 and 6 were dry during the month of August*

September

Site	TKN	NO2+NO3	Ammonia	Total N	Organic N	Total P
Site 1	0.38	0.005	0.0	0.385	0.38	0.033
Site 2	0.32	0.013	0.02	0.333	0.3	0.026
Site 3	2.36	0.158	0.04	2.518	2.32	0.163
Site 4	13.7	0.332	4.57	14.032	9.13	3.15
Site 5	15.6	0.347	5.23	15.947	10.37	4.12

**Site 6 was dry during the month of September*

October

Site	TKN	NO2+NO3	Ammonia	Total N	Organic N	Total P
Site 1	0.31	0.005	0.0	0.3125	0.31	0.02
Site 2	0.47	0.019	0.0	0.489	0.47	0.029
Site 3	2.05	0.618	0.04	2.668	2.01	0.191
Site 4	11.7	0.827	3.12	12.527	8.58	3.14
Site 5	12.5	1.14	3.94	13.64	8.56	3.64

**Site 6 was dry during the month of October*

APPENDIX H – AMMONIA RESULTS

June

Site	Acute Limit	Chronic Limit	Measured NH3	Acute Exceedance?	Chronic Exceedance?
Site 1	6.189	1.546	0.005*	N	N
Site 2	3.883	0.0952	0.005*	N	N
Site 3	5.839	1.340	0.05	N	N
Site 4	23.0	3.117	7.9	N	Y
Site 5	16.225	2.889	9.77	N	Y
Site 6	21.099	2.973	0.005*	N	N

**Indicates a level below the detection limit.*

July

Site	Acute Limit	Chronic Limit	Measured NH3	Acute Exceedance?	Chronic Exceedance?
Site 1	4.715	0.991	0.02	N	N
Site 2	4.715	0.935	0.02	N	N
Site 3	8.408	1.709	1.32	N	N
Site 4	1.556	0.308	1.41	N	Y
Site 5	0.872	0.185	3.13	Y	Y
Site 6	5.727	1.301	0.06	N	N

August

Site	Acute Limit	Chronic Limit	Measured NH3	Acute Exceedance?	Chronic Exceedance?
Site 1	5.727	1.518	0.005*	N	N
Site 2	3.883	1.037	0.01	N	N
Site 4	6.948	1.191	3.22	N	Y
Site 5	4.715	1.023	3.17	N	Y

**Indicates a level below the detection limit. Also, Sites 3 and 6 were dry for the month of August*

September

Site	Acute Limit	Chronic Limit	Measured NH3	Acute Exceedance?	Chronic Exceedance?
Site 1	8.408	2.314	0.005*	N	N
Site 2	3.883	1.057	0.02	N	N
Site 3	5.727	1.761	0.04	N	N
Site 4	5.727	0.992	4.57	N	Y
Site 5	3.883	1.030	5.23	Y	Y

**Site 6 was dry for the month of September*

October

Site	Acute Limit	Chronic Limit	Measured NH3	Acute Exceedance?	Chronic Exceedance?
Site 1	5.727	2.912	0.005*	N	N
Site 2	3.883	1.989	0.005*	N	N
Site 3	5.727	2.912	0.04	N	N
Site 4	3.203	1.713	3.12	N	Y
Site 5	1.556	0.796	3.94	Y	Y

**Site 6 was dry for the month of October*

APPENDIX I - RESULTS FOR ELECTRICAL CONDUCTIVITY, TEMPERATURE, DISSOLVED OXYGEN AND pH.

June

Site	Electrical Conductivity (EC) (µs/cm)	Temperature (˚C)	Dissolved Oxygen (DO) (mg/L)	pH
Site 1	999	17.8	*	8.16
Site 2	*	19.23	*	8.4
Site 3	*	19.29	*	8.19
Site 4	*	21.0	*	7.4
Site 5	*	19.0	*	7.63
Site 6	*	21.0	*	7.46

**Data is unavailable due to problems with the equipment*

July

Site	Electrical Conductivity (EC) (µs/cm)	Temperature (˚C)	Dissolved Oxygen (DO) (mg/L)	pH
Site 1	865	21.2	7.82	8.3
Site 2	855	22.1	8.41	8.3
Site 3	2330	20.0	4.8	8.0
Site 4	1893	23.9	16.22	8.9
Site 5	1841	25.5	9.96	9.3
Site 6	1026	19.5	3.6	8.2

August

Site	Electrical Conductivity (EC) (µs/cm)	Temperature (˚C)	Dissolved Oxygen (DO) (mg/L)	pH
Site 1	535	17.1	7.6	8.2
Site 2	548	17.9	9.2	8.4
Site 4	2313	23.3	0.54	8.1
Site 5	2150	20.7	6	8.3

**Sites 3 and 6 were dry for the month of August*

September

Site	Electrical Conductivity (EC) (µs/cm)	Temperature (˚C)	Dissolved Oxygen (DO) (mg/L)	pH
Site 1	1019	15.3	9.26	8.0
Site 2	942	17.6	10.42	8.4
Site 3	3500	14.8	13.25	8.2
Site 4	2300	23.7	6.3	8.2
Site 5	2200	18.0	8.4	8.4

**Site 6 was dry for the month of September*

October

Site	Electrical Conductivity (EC) (µs/cm)	Temperature (˚C)	Dissolved Oxygen (DO) (mg/L)	pH
Site 1	1519	6.7	10.39	8.2
Site 2	1660	7.8	12.25	8.4
Site 3	3116	4.6	12.2	8.2
Site 4	2198	7.5	4.38	8.5
Site 5	2176	9.2	9.67	8.9

**Site 6 was dry during the month of October*

ATTACHMENT A - FIELD SUPPLY LIST

This checklist includes field supplies and numbers needed per site sampled.

1) Physical Attributes

- ☐ 1 - Magellan SportTrak MAP GPS unit
- ☐ Maps (topographic, Forest Service, BLM)
- ☐ Digital camera with additional memory card(s)
- ☐ YSI 85 (previously YSI 556) meter (with calibration solutions, calibration log, and users manual)
- ☐ Oakton Waterproof pH Tester 1
- ☐ 1 - small squirt bottle of DI water to clean probes
- ☐ Marsh-McBirney flow meter
- ☐ 1 - top-setting wading rod for use with flow meter
- ☐ 2 - tapes (1, 100 ft., 1 300 ft.) for determining cross-sections
- ☐ 2 - chaining pins or bank stakes

2) Water Column Samples

- ☐ 1 - 250 ml (State lab) or 500 ml (Energy lab) plastic bottle for nutrients
- ☐ 1 vial of sulfuric acid for preserving nutrients

3) Macroinvertebrates

- ☐ 1 - 1000 ml wide mouth jar
- ☐ 1 - D-frame kick net, mesh size 1200 uM
- ☐ 1 - Sieve (500 uM)
- ☐ 80% ethanol solution
- ☐ Tweezers
- ☐ Parafilm

4) Field Forms and Labels

- ☐ Pre-made site visit labels to affix to forms
- ☐ Activity labels
- ☐ Site visit form with chain-of-custody
- ☐ Bottle labels and clear tape for covering labels

5) Other

- ☐ Field Procedures Manual
- ☐ Clipboard
- ☐ Coolers
- ☐ Hip boots or waders (including repair kit)
- ☐ Extra batteries (laser level, flow meter, YSI, camera, rangefinder and GPS unit)
- ☐ Gloves (latex-free)
- ☐ Mosquito repellent and sunscreen
- ☐ Trash bags
- ☐ Pencils and Sharpies

ATTACHMENT B - PROTOCOL FOR DETERMINING FLOW PHYSICAL CHARACTERISTICS

Total Discharge (flow)

Three methods are available for measuring flow. These are (in descending order of preference), flow meter, float method, and visual estimation. The practicality of using certain methods is largely dependent upon the flow condition of the stream. For instance, a flow meter is useless in a stream that doesn't have enough water to reliably use the instrument.

Flow Meter Method (quantitative)

Appropriate for narrow streams where 10-15 points can be measured in a cross section or wide streams where 25-30 ft. points can be obtained. Multiple readings are necessary for channels that are complex, and variable in their shape and flow patterns.

Note: It is acceptable for flow meter recordings and channel cross-sections to be performed simultaneously provided the nature of the site is amenable to this and there are two experienced field crew members available.

- ☐ Stretch a tape between end-points of your cross-section (often placed at bankfull or wider locations).
- ☐ Divide the distance from left water's edge to right waters edge by 25-30 to determine the number of stations; round to nearest ¼ foot for ease of accurately determining the width of the stations.
- ☐ Start at left water's edge and call out the location from the tape first. Stand downstream from the tape and meter, and at least 18" off to the side to avoid disrupting the flow measurement. Point the probe directly into the flow with the rod held vertically.
- ☐ Read the depth to the person recording the data.
- ☐ Take the reading at 0.6 depths by adjusting the top-setting rod. Allow the reading to settle to a fairly stable value and read the velocity.
- ☐ The person recording the data should fill out the header information on the total discharge form using the corresponding label, and the following fields: distance from initial point, depth and velocity.

Recording flow (discharge) measurements

- ☐ On the Site Visit Form, indicate the method used. For instance, if the float method was used, check the float box.
- ☐ If flow was estimated visually, record the estimated value on the Site Visit Form as cfs. Flows of zero cfs must have the appropriate comment box checked (e.g., Dry bed or No measurable flow).
- ☐ If the float method or flow meter is used, fill out the information at the top of Total Discharge form using preprinted labels. If you don't have enough labels, please fill out the information by hand.
  - For flow meters, record cross-sectional flow values according the method. Flow values can be calculated back at the office for flow meter measurements using an excel spreadsheet.
  - For the float method, record the results of the three time distance measurements as a footnote to the discharge form.

ATTACHMENT C - PROTOCOL FOR COLLECTING MACROINVERTEBRATES

There are two primary methods (traveling kick and jab techniques) for collection of macroinvertebrate samples and a third, optional method (Hess Sampler). The Hess method is not included in this manual but can be found in the full text of DEQ SOP WQPBWQM-009.

Traveling Kick Method

This procedure is appropriate for sampling macroinvertebrates in riffle environments with gravel and cobble substrate. Equipment required (see Attachment B)

- ☐ Position the D-frame net in the stream so that the "flat" side of the hoop is snug against the substrate, with the opening facing upstream. The net handle should be approximately perpendicular to the water's surface.

- ☐ Use one or both feet to loosen and churn the substrate upstream in front of the net opening. The churning and digging motions should be vigorous enough to disturb the several top inches of substrate and loosen any tightly clinging organisms. The path traveled should either run diagonally across the riffle (if the stream is small enough) or include three short runs in different depths and flows within the riffle.

Note:

For a *semi-quantitative sampling*, the estimated area of substrate disruption and the total time of sampling must be recorded (by a member of the crew observing the sampler). The total area and time should be sufficient to collect a macroinvertebrate sample containing 300+ organisms.

For *qualitative sampling*, the time and area of disturbance are not as important. The sample collection should be disturbed thoroughly so as many taxa as possible are collected.

- ☐ A fine sieve (500 um) may be used to clean the extra sediment, and/or to take out large sticks and coarse gravel from the sample. Rinse and clean the net thoroughly after each sample has been collected to prevent contamination of the next sample. The large rocks and sticks may be discarded after they have been thoroughly cleaned and examined.

- ☐ Transfer the sample to a 1 L bottle in small portions to minimize loss - until it is **HALF FULL**. Fill remaining space in bottle with ethanol until full (400-500 ml). Extra bottles may be required to collect the entire sample.

- ☐ The sample must be identified with an internal and external label with the following information:
  - Outside label (stuck to the outside of the bottle).
  - Activity ID
  - Collection Date
  - Waterbody Name
  - Collector's Name
  - Sample Type

- Internal label written in **pencil** and placed inside the sample bottle.

☐ After placing the inside label in the bottle, secure the bottle cap and cover it with **parafilm** to avoid leakage.

☐ Place the outside label and cover it with clear tape.

☐ Place samples in a cooler w/o ice. Be sure bottles **will not fall over.**

Jab Method

When riffles are rare or non-existent, as in low-gradient streams, the D-Frame net jab sampling method is used to collect multiple “jabs” throughout the sampling site. A single jab is meant to sample approximately 1 meter of length with the net; there should be 20 jabs per sample.

☐ Equipment required is the same as traveling kick (see Attachment C).

☐ Select the reach to be sampled: Select a reach of at least 1 meander length, or 20 bankfull channel widths. Examine and record the approximate proportion of productive macroinvertebrate habitat. Productive habitat types are: riffles, snags, aquatic vegetation, and bank margins.

Determine how many jabs are required to accurately represent all habitat types. For example, if 50% of the available habitat is snags, 20% aquatic vegetation, and 30% riffle, select the number of jabs out of twenty proportional for each habitat type (i.e., snags: 10 jabs, aquatic vegetation: 4 jabs, riffle: 6 jabs).

☐ Collect the 20 jab sample: Sampling should be conducted moving in an upstream direction through the reach, proportionally allocating jabs among habitat types as determined above.

Note:

- In runs or riffles that are *primarily bedrock or boulder substrate*, jab for a length of 1 meter in between boulders or where the bedrock contains some cobble. Jab net along substrate in an upstream direction, attempting to dislodge and catch invertebrates without retaining excessive debris.

- *If snags are present*, sample roughly an equivalent of a meter sweep. Sweep through and around the snag in such a way as to dislodge and capture inhabitants. Inhabitants should be scrubbed off by hand into the net on coarser snags. In case of aquatic vegetation, sweep the net through the vegetation for about 1 meter trying to loosen inhabitants.

☐ Transfer the sample to the 1 L bottle in small portions to minimize loss until it is **HALF FULL**. Add ethanol (ETOH) **TO THE TOP (400-500 ml).** A fine sieve may be used to clean the extra sediment, and/or to take out coarse gravel from the sample**. Extra bottles** may be required to collect the entire sample.

☐ The sample must be identified with an internal and external label with the following information:

Outside label (stuck to the outside of the bottle).

- Activity ID
- Collection Date
- Waterbody Name
- Collector’s Name
- Sample Type

☐ The internal label must be written in **pencil** and placed inside the sample bottle with the following information:
- Activity ID
- Collection Date
- Waterbody

☐ After placing the inside label, place the bottle cap, and cover it with **parafilm** to avoid leakage.

☐ Place the outside label and cover it with clear tape.

☐ Place samples in a cooler w/o ice. Be sure bottles **will not fall over**.

Recording macroinvertebrate sampling event

☐ On the Site Visit Form indicate a macroinvertebrate sample was taken by checking the appropriate box.

☐ Record the Sample ID (Activity ID w/medium code) on the Site Visit Form.

☐ Circle “**KICK**” or **“Jab”** on the Site Visit Form under Sample Collection Procedure.

Note:
- For traveling kick net, record duration, kick length, number of sample jars and net mesh size.

- For Jab technique, record number of jabs, number of sample jars and net mesh size.

☐ Complete the Macroinvertebrate Habitat Assessment Form for habitat type (riffle or pool).

- Complete this form **ONLY** if you have taken a macroinvertebrate sample.
- Use labels (if available) to fill out the upper portion of the form, otherwise, fill it out by hand.
- Complete this form for the stream type of either “Riffle/Run” or “Glide/Pool”, but not both.
- For each of the habitat parameters, carefully read each of the options, and select a numeric score that best represents the conditions where the macroinvertebrate sample was collected.

ATTACHMENT D-GRAB SAMPLING FOR CHEMISTRY

DEQ uses two different grab sampling techniques for water and sediment samples. Water samples are generally taken at every site; whereas sediment samples are optional samples based on the potential for high metals concentrations from mining or other significant earth disturbance activities in the watershed. This study will not include any metals testing, and any chemical samples obtained are for nutrients only.

Water Samples

- ☐ Clean sample bottles are rinsed three times with the ambient water being sampled. After rinsing, fill the bottles with fresh water collected upstream from any previous disturbances to avoid contaminating the sample.

- ☐ Sample bottles should be identified with the following information

  - Activity ID
  - Collection Date
  - Waterbody Name
  - Collector's Name
  - Sample Type

- ☐ Keep samples in a cooler with ice. Be sure lids are tight and that no leaking will occur.

ATTACHMENT E-SITE VISIT FORM

Date ________________ Time ____________ Personnel: ______________________________

Waterbody ______________________________ Location ______________________________

Station ID: ________________ Visit ________ HUC: ________________ County: ________________

Latitude _. 9 Longitude: _. 9 Lat/Long Verified? ☐

Elevation (m): ________________ GPS Datum: NAD27 **NAD83** WGS84

Samples Collected:		**Sample ID** (Provide for **all** samples)**:**		**Sample Collection**
Water	☐			GRAB
Analysis Requested:				Preservative: HNO_3 H_2SO_4 HCL None
Analysis Requested:				Preservative: HNO_3 H_2SO_4 HCL None
Analysis Requested:				Preservative: HNO_3 H_2SO_4 HCL None
Sediment	☐			SED-1
Analysis Requested:				
Chlorophyll a	☐			C=Core H=Hoop T=Template N= No Sample
Chlorophyll a Transect:		1_2_3_4_5_6_7_8_9_10_11_.		
Phytoplankton	☐			PHYTOPLANK Volume Filtered (mL):
Algae/Macrophytes	☐			PERI-1 OTHER:
Macroinvertebrate	☐			KICK HESS JAB OTHER:
Kick/Jab Length (ft):		Kick Duration/# Jabs:	# of Jars:	Mesh Size: 1200 1000 500 OTHER:

Field Measurements:			**Field Assessments:**
Temp:	W °C °F	A °C °F	Habitat Assessment: Reach Scale ☐ Site Scale ☐
pH:			EMAP Assessment ☐
SC: (umho/cm)			Substrate: Pebble Count ☐ Percent Fines ☐ RSI ☐
DO: (mg/L)			Channel Cross-Section ☐
Turbidity: Clear ☐ Slight ☐ Turbid ☐ Opaque ☐			Photographs: Digital ☐ Film ☐
Flow: (cfs)			Other Assessments:
Flow Method: Meter ☐ Float ☐ Gage ☐ Visual Est. ☐			
Flow Comments: Dry Bed ☐ No Measurable Flow ☐			
Other Flow Comments:			

Site Visit Comments:

Chemistry Lab Information:		
Lab Samples Submitted to:	Account #:	Date Submitted:
Invoice Address & Phone: DEQ 1520 East 6th Avenue Helena, MT 59620 (406) 444-4205		
Contact Name & Phone: Rosie Sada (406) 444-5964		
EDD ☒ Format: SIM Compatible	Term Contract Number: SPB05-894PB	
Relinquished By & Date/Time:	Shipped By & Date/Time:	Received By & Date/Time: